ORGANIZATIONAL CHANGE ADOPTION WITHIN THE AEC INDUSTRY: CHANGE MANAGEMENT PRACTICES AND EMPLOYEE REACTIONS TO CHANGE

By

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ABSTRACT

In today's rapidly evolving market, effective organizational change adoption has become a core competency for architecture, engineering, and construction (AEC) firms to maintain their competitive advantage. Firms that more effectively manage organizational change can position themselves as early adopters and are able to expend fewer resources in making the transition. On the topic of organizational change adoption, previous studies within the AEC industry are generally limited to datasets of a single or a small number of organizational change initiatives. To address this gap, this study has collected a dataset of 237 unique organizational change initiative within separate AEC firms. There were several research objectives of this study. First, leading change management strategies and their relationship with successful change adoption in AEC firms was investigated. The change management strategies documented within this study were identified from the organizational behavior literature, which contributed an interdisciplinary approach to the study. Second, this study sought to measure how AEC employee firms react to the implementation of organizational changes in their companies. This contributes an understanding of the extent that the AEC industry reacts in a favorable (or unfavorable) manner towards organizational change initiatives in comparison with other industry sectors. Finally, analysis was conducted to determine whether employee reactions moderates the effect between effective change management practices and successful change adoption. Overall contributions of this study include the collection of a global dataset, which is meaningful to the AEC literature that has primarily consisted of case-based research methods and limited sample sizes. This study contributes practical change management practices for industry professionals to more effectively manage the adoption of change within their companies. Another contribution is that the employees within the AEC industry display an overall favorable response to organizational change that is comparable with

other industry sectors. This is encouraging given this study's finding that AEC firms who more effectively fostered favorable employee reactions were able to achieve greater success in change adoption.

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CHAPTER 1: INTRODUCTION

Implementing organizational change is a complex, challenging, and often ends with companies failing to successfully adopt the change into their long-term operations (Ahn *et al.*, 2004). The architecture, engineering and construction (AEC) industry faces unique challenges with organizational change adoption compared with other industries, particularly considering its project-based industry structure. The fact that each project contains unique with its specifications, schedule and budget requirements, and project team stakeholders can make it difficult for AEC firms to achieve consistent change adoption throughout their operations (Teicholz *et al.*, 2001, Sveikauskas *et al.*, 2014). The challenges of adopting modern methods of construction was illuminated by Rahman (2014), who identified twenty-six separate barriers to change adoption.

Within this study, organizational change was defined as the planned implementation of a fundamental shift in the company's operations. Examples of common organizational change initiatives within the AEC industry include the adoption of a new technology, software, management approach, or corporate structure with the intent to permanently adjust some aspect of the company's operations (Damanpour, 1992; Baregheh *et al.*, 2009).

Previous articles of organizational change within the AEC industry were predominantly based on either case studies or surveys of individuals with a limited dataset measured by organizational change initiatives. To address this gap in the literature, this study has collected 237 dataset points globally where each dataset represents a unique organizational change initiative within a separate AEC firm.

There were several research objectives of this study. First, leading change management strategies and their relationship with successful change adoption in AEC firms was investigated.

The change management strategies documented within this study were identified from the organizational behavior literature, which contributed an interdisciplinary approach to the study. Second, this study sought to measure how AEC employees firms react to the implementation of organizational changes in their companies. This contributes an understanding of the extent that the AEC industry reacts in a favorable (or unfavorable) manner towards organizational change initiatives in comparison with other industry sectors. Finally, analysis was conducted to determine whether employee reactions moderates the effect between effective change management practices and successful change adoption.

1.1. Description of the Research

This section discusses the anticipated contributions of this study. The research approach followed to achieve these objectives and thesis organization is also presented.

1.1.1 Anticipated Contributions of this Study

This study is expected to benefit industry professionals and the body of knowledge. The anticipated contributions to the body of knowledge include:

1. Collection of a robust, global sample of organizational change initiatives across the AEC industry. The study's unit of measure was designed such that each data point represented a distinct organizational change initiative within a separate AEC firm. This builds upon the existing literature, which largely consists of sample sizes of less than five organizational change initiatives.
2. Interdisciplinary approach to establish the relationship between leading change management practices in the organizational behavior literature and the successful adoption of organizational change initiatives within AEC companies.

The anticipated contributions to the AEC industry include:

1. This study has practical implications for industry professionals by establishing a rank-ordered list of key change management practices that, when effectively executed, are directly linked with more successful change adoption outcomes.
2. Employees within the AEC industry display an overall favorable response to organizational change that is comparable with other industry sectors. This is encouraging given this study's finding that AEC firms who more effectively fostered favorable employee reactions ultimately achieved greater success in change adoption.

1.1.2 Research Approach

This research was divided into two subtopics:

a) Drivers of Organizational Change Adoption within the AEC Industry

This section was performed by analyzing the responses of questionnaire surveys collected from AEC companies across the world. The questionnaire measured the effectiveness with which each company executed certain change management practices during their change implementation process. Several measures were also included to assess the extent to which each company was able to achieve successful change adoption (or not).

b) Employee Reactions to Change within the AEC Industry

Responses of the employees' reactions were collected from a global questionnaire survey. Each participating AEC firm was asked to rate the most prevalent employee reactions they observed within their company throughout their respective change initiatives. This enabled the spectrum of employee reactions to organizational change to be compiled across 137 change initiatives within AEC firms. The impact of employees' reactions was also analyzed determine its mediation effect between effective change management practices and successful change adoption

Interviews were also conducted with industry professionals to understand manifestations of employee resistant to – and support fir – change initiatives within their organizations.

1.1.3 Thesis Organization

This thesis is comprised of five chapters:

Chapter 1 Introduction, presents a short background of this research about organizational change adoption and its drivers and the effect of employees' reactions towards change adoption. The introduction also contains the objective of this study and approaches used for this research.

Chapter 2 contains the literature review methodology of this research. Past literature that discussed barriers and drivers to change adoption and breakdown of past literature based on researched country and published year was shown in this chapter.

Chapter 3 documents the research to identify the top change management strategies that should be concerned to adopt change successfully. This section documents the literature review, method of analysis, results, interpretation of those results, and summarizes the conclusions. Chapter 3 was documented in the journal paper format and the condensed version of this paper has been accepted by *Journal of Management in Engineering* for publication.

Chapter 4 presents the research conducted on employees' reactions towards the change adoption. This chapter has its own literature review, methodology, results, discussion, and conclusion. This part of the study also includes responses to interviews with industry professionals.

Chapter 5 documents a summary of results and conclusions of this research, and it also presents recommendations for future research in this area.

The Ordinal Logistic Regression (OLR) results, Survey Questionnaire, Interview Questionnaire, and Change Adoption cases are attached in the Appendices at the end of this thesis followed by references used in this research effort.

CHAPTER 2: LITERATURE REVIEW METHODOLOGY

2.1 Introduction

Previous studies regarding organizational change within the AEC industry were collected with the objective of identifying both the barriers and drivers to of successful change adoption. A thorough analysis of previous studies was also intended to identify potential gaps in the body of knowledge by assessing the following items:

1. The data collection methods and the data samples (particularly the number of organizational change initiatives captured in previous data sets) used in past literature.
2. The frequency of published articles in each year for last ten years.
3. Countries in which the research was performed.
4. The most common types of organizational change initiatives studied within the AEC industry.

2.2 Literature Collection Methodology

A two step method of the literature review was performed on published articles for the last ten years (2005-2015).

First, a keyword search within five leading journal publications for last ten years (2005-2015). Those are *Journal of Construction Engineering and Management*, *Journal of Management Engineering*, *International Journal of Project Management*, *Engineering, Construction, and Architecture Management,* and *Automation in Construction*. As a result of this search, eighty-four published articles were collected.

As a second step of literature review, a broad keyword search was conducted within multiple international online databases including the American Society of Civil Engineers (ASCE)

online library, Emerald Insight, Elsevier online library, and the University of Kansas online libraries. The keywords used in this search were "Change Adoption," "Change Implementation," "Organizational Change Adoption," "Implementation," "Organizational Adoption" and "Innovation." This keyword search resulted in collecting thirteen additional articles that had not previously been collected. These articles were filtered to remove studies that whose primary research objective was not focused on organizational change adoption and implementation. Finally, a total of eighty-three of the relevant articles were collected for the literature review.

These identified articles were reviewed and the required information was tabulated in a spreadsheet. The frequency of the published articles on organizational change by each journal is shown in Table 1. The *Journal of Construction Management* by ASCE published as many as thirty articles in the last ten years, making up 36% of the total collected articles. *Journal of Management Engineering* stood in second place with nineteen articles and 22.9% of the total, followed by *Engineering Construction & Architectural Management*, published by Emerald Insight, with sixteen articles (19.28% of total collected articles). *Automation in Construction* and the *International Journal of Project Management* published nine (10.84%) and eight (9.64%) articles, respectively, which were related to organizational change. One paper was captured from *Leadership and Management in Engineering*, which was published in 2003.

Table 1. Frequency of the Published Article on Organizational Change

Name of Journal	Frequency (n)	Percentage (%)
Journal of Construction Engineering and Management	30	36.14
Journal of Management Engineering	19	22.89
Engineering Construction & Architectural Management	16	19.28
Automation in Construction	9	10.84
International Journal of Project Management	8	9.64
Leadership and Management in Engineering	1	1.20
Total	**83**	**100**

2.3 Distribution of Literature According to the Year of Publication

Further examination was performed based on the year of publication. The year of publication is shown in Fig. 1 for each article published on the topic related to organizational change with the AEC industry. This breakdown indicates that the year 2015 had many articles published (20.48%) followed by 2010 (10.84%) and 2013 (10.84%). In 2012, 9.64% of collected articles were published and 8.43% of collected articles were published in 2014. In both 2008 and 2011, 7.23% of collected articles were published. The lowest amount (3.61%) of total collected articles was published in 2005 and 2006 individually.

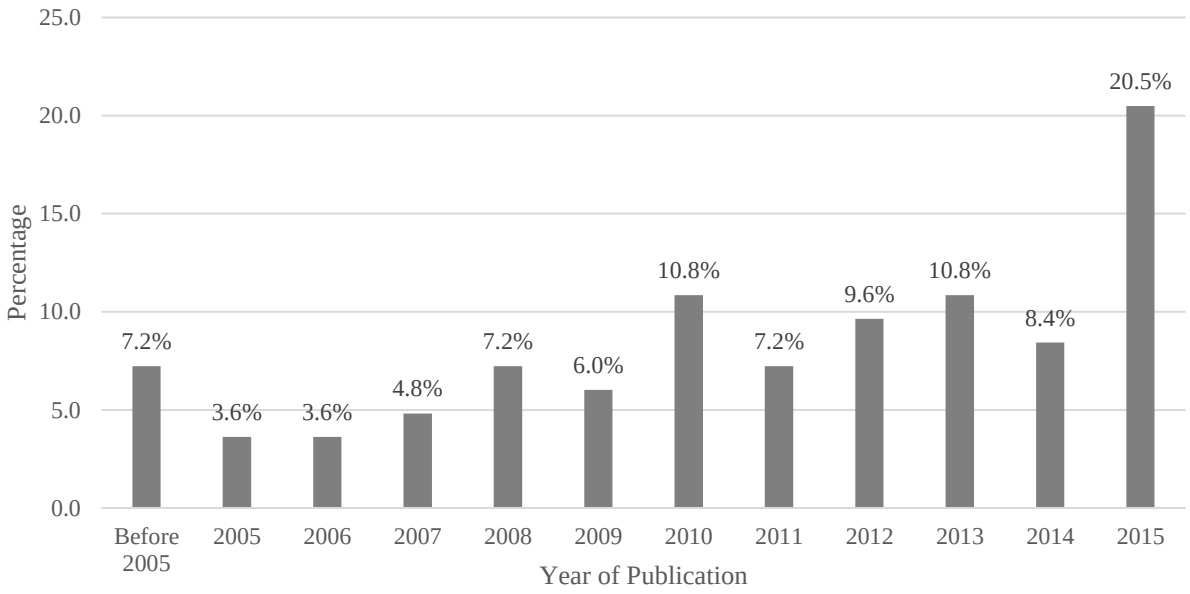

Figure 1. Distribution of Articles According to Year of Publication

2.4 Distribution of Literature According to Country of Research

Another examination was conducted on the data based on the country in which the research was performed, and details are shown in Table 2. This analysis concluded that the UK had a large amount of research on Organizational Learning and Organizational Change. Twelve of the collected articles (14.2%) were researched in the UK. Australia stood in the second position with ten articles, which made up 12.0% of total collected articles, followed by the Korea and Singapore

with five articles each, which made up 6.0%. The USA and China had four articles (4.8%) published so far. Hong Kong, India Turkey had at least two articles on the topics related to Organizational Change Adoption. Nine published articles collected data from two or more countries. Other countries like Chile, Malaysia, Taiwan, Tanzania, Denmark and Nigeria, each country had only one research publication. The majority of collected articles (15.6%) in this study did not mention the country of research. Eight of collected articles were based on qualitative (theoretical) research.

Table 2. Summary of Literature Paper Distribution According to Country of Research

Country	Frequency (n)	%
UK	12	14.5
Australia	10	12.0
Korea	5	6.0
Singapore	5	6.0
USA	4	4.8
China	4	4.8
Hong Kong	2	3.6
India	2	2.4
Turkey	2	2.4
Nigeria	1	1.2
Chile	1	1.2
Malaysia	1	1.2
Tanzania	1	1.2
Denmark	1	1.2
Taiwan	1	1.2
Theoretical	8	9.6
Two or more countries	9	10.8
N/A	13	15.6
Total	**83**	**100**

2.5 Distribution of Published Articles According to the Data Collection Method

These studies include diversified methods for collecting data like case studies, interviews, surveys, etc., and some articles performed analysis on secondary data. A breakdown of these data collection methods is shown in Table 3.

It was observed that most frequently employed research method used to collect data on the topic of AEC organizational change was the survey methodology (45.7%). Twenty-two percent of published articles had case studies while 14% of articles conducted interviews for their research. Around 10% used both surveys and interviews. Only one paper performed the analysis on secondary data. All of these surveys collected were either from different employees of the same organization on a single change event or employees of different organizations based on less than five change events. Case studies were used to collect a detailed information from professionals of the organizations with similar kinds of change events. Similarly, interviews were performed either in a single organization or in multiple organizations with similar kinds of change implementation cases.

Table 3. Distribution of Published Articles According to the Data Collection Method

Data Collection Method	Frequency (n)	Percentage (%)
Surveys	38	45.7
Case Studies	18	21.6
Interviews	12	14.4
Surveys and Interviews	8	9.6
Surveys and Case Studies	3	3.6
Interviews and Case Studies	3	3.6
Analysis of Secondary Data	1	1.2
Total	**83**	**100**

2.6 Organizational Change Initiatives Captured within Previous Studies

The majority of the published articles consisted of data samples limited to a single organizational change adoption case. The types of organizational change initiatives captured within previous studies varied widely; some focused on software implementations, others on the application of various technological advancements, some on project management practices, and others on risk or safety programs the published articles had researched on implementing a technology, some researched on implementing a new method of practice, while some researched

on safety management and risk management programs. These organizational change initiatives are categorized and the frequency is shown in Table 4. The total list of organizational change cases is attached in the Appendix section.

Characteristics of the data sample from each literature study are shown in Table 5. Particular emphasis was placed on determining the number of separate organizational change initiatives included within each study's data sample. It was observed that most of the published journals researched on a single organizational change initiative. Only four published articles incorporated a dataset of more than fifty separate organizational change events (50, 58, 87, and 153). To address this gap in the literature, this thesis was designed to collect 237 survey responses from a global sample, where each response was measured at the unit of the single separate organizational change event.

Table 4. Summary of Organizational Change Initiative Categories Captured in Literature

Category	Frequency (n)	Common Examples
Software Implementation	10	BIM, Web Based Project Management
Technology Implementation	28	Automated Camera, Mobile Communication
Project Management Practices	19	Bid Build Procurement, Lean Construction
Safety or Risk Programs	11	Risk Management, Value Management
Others	3	Estate Regeneration Projects, Environmental Format Store, Eco-Residence Project

Table 5. Number of AEC Organizational Change Events Captured within the Literature

Number of AEC Organizational Change Events Captured within Data Sample	Number of Articles Published(n)	Percentage (%)
0 (Theoretical)	8	9.6
1	51	60.2
2	3	3.6
3	2	2.4
4	3	3.6
5-10	3	3.6
10-50	9	10.8
50-100	3	3.6
100+	1	1.2

CHAPTER 3: DRIVERS OF ORGANIZATIONAL CHANGE ADOPTION WITHIN THE AEC INDUSTRY: LINKING CHANGE MANAGEMENT PRACTICES WITH SUCCESSFUL CHANGE ADOPTION

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Abstract: In today's rapidly evolving market, effective organizational change adoption has become a core competency of architecture, engineering, and construction (AEC) firms to maintain their competitive advantage. Firms that more effectively manage organizational change adoption can position themselves as early adopters are able to expend fewer resources in making the transition. The objective of this study was to collect a global sample of organizational change initiatives across the AEC industry to identify whether specific change management practices have a direct relationship with successful change adoption. Based on a data sample of 237 organization-level change initiatives, the results of this study establish that there are definitive – and learnable – change management practices that AEC firms can implement to increase the success of their change initiatives. The global data sample within this study is a meaningful contribution to the AEC literature, which primarily consists of case-based studies that are limited to a single type of organizational change event. Further, this study contributes practical action steps for industry professionals to more effectively manage the adoption of new technologies, management strategies, and business practices within their organizations.

3.1 Introduction

In today's rapidly evolving market, effective organizational change adoption has become a core competency of AEC firms to maintain their competitive advantage. There are many forms of organizational change within the industry; for example, the continual evolution of information technology has had vast impacts on AEC firms, such as the integration of BIM, smart products, mobile technology, safety monitoring equipment, building scanning technology, virtual design and construction, and e-document management. Other organizational changes include advancements in management and operational strategies, including modular techniques, the increasing industrialization of construction operations, expansion of pre-construction services, increasing design and construction integration, advanced work packaging, and evolving project delivery methods. Within the context of this study, organizational change is defined as a planned and intentional alteration of an organization's traditional practices with the intent of changing the company's long-term operating protocols.

Regardless of which particular change, an AEC company may consider, firms that more effectively manage organizational change adoption can position themselves as early adopters and can expend fewer resources in making the transition. The result is that successful organizational change management enables firms to be faster to market, respond to evolving market conditions, and differentiate themselves from their competitors. Yet organizational change adoption is inconsistent across the industry, which raises a fundamental research question: how are some companies able to more effectively implement organizational changes while others are less successful?

The objective of this study was to establish the existence of industry-wide relationships between certain change management practices and the adoption of organizational change within

the AEC industry. Key change management practices, widely recognized in the organizational behavior literature, were identified from the existing body of knowledge. Although these change management practices have been studied within AEC literature, their discussion and analysis have typically been restricted to case study methods or other limited data samples (typically comprised of only a handful or fewer companies), oftentimes focused on the adoption of a particular technology or singular operational change. There is a need to establish the presence of broader industry trends related to the management of organization-level change initiatives. In order to address this gap in the literature, the objective of this study was to conduct an international survey to more broadly establish the influence of key change management practices on facilitating successful organizational change adoption within AEC firms. The results of this study are intended to confirm that there are certain change management strategies that AEC firms can use to adopt company-level change initiatives more successfully.

3.2 Literature Review

The literature review was conducted with an interdisciplinary focus by examining key change management practices from the field of organizational behavior. These practices were then coupled with examples of where they have been documented within the AEC literature. As stated previously, it should be noted that the AEC literature is primarily limited to case studies and relatively small data sets focused on a singular organizational change initiative, which further motivated the interdisciplinary approach to the literature review.

Visible Commitment of Senior Leadership

Securing executive sponsorship is widely credited as being a driver of successful change adoption within the organizational behavior literature. Beer and Eisenstat (1996) suggested that before a change is implemented, senior leadership's role is to demonstrate that the proposed change

is pertinent and suitable to the organization's position in the marketplace. Visible commitment from senior leaders is also required for the duration of change implementation to build credibility mentioned Armenakis *et al.* (1999). Otherwise, employees may perceive that the change initiative is merely a passing "fad" that will eventually be abandoned (Emiliani & Stec, 2004).

Within the AEC industry, senior leadership commitment has also been noted as a key factor in organizational change implementation. In a study of construction projects within the US and Singapore, management commitment was identified as a major barrier to adopting human resource practices for safety management (Lai *et al.* 2011). Shehu and Akintoye (2010) found a lack of commitment from senior leaders to be the single largest barrier to the successful implementation of program management among organizations in the UK construction environment. BIM adoption has also been linked to consistent support from top management within design firms (Ding *et al.* 2015, Son *et al.* 2015). Management-focused changes, such as the adaptation of Six Sigma within the construction, have also been shown to benefit immensely from active senior leadership support (Pheng & Hui, Implementing and Applying Six Sigma in Construction, 2005). However, such studies have focused on a range of disparate types of organizational change and are often limited to data sets of several organizational cases, isolated geographic locations, or particular industry sectors.

Extensively Communicate the Benefits for Employees

The field of organizational behavior has long credited communication of a well thought out change message as being a major driver of change readiness among employees (Armenakis *et al.* 1993). An entire area of inquiry has focused on specific aspects that comprise a successful change message, much of which boils down to actively answering the question of "what's in it for me?" for each employee within the company. This question is often referred to as addressing

"personal valence" within the organizational behavior literature (Armenakis *et al.* 1999, Holt *et al.* 2007, Self and Schraeder 2009). Cameron and Quinn (1999) noted must demonstrate not only the benefits of a change but also emphasize the disadvantages of remaining with the status quo. Without extensive communication of the benefits a change will bring, organizations are sure to encounter resistance due to employees' uncertainty with the new process and fear of unknown consequences (Bourne, *et al*., 2002).

In a case study inquiry of three large Australian construction companies, Peansupap and Walker (2006) found that a leading factor affecting the diffusion of information and communication technologies was the lack of clear benefits communicated to the companies' employees. Case studies of several UK architectural firms implementing BIM and lean practices revealed that overcoming resistance to the change often stemmed from the inability for personnel to understand the benefits compared to their traditional drafting practices (Arayici, *et al.*, 2011). A somewhat unique–and significant–aspect of organizational change to consider within the AEC industry is the influence of unionized labor forces. In their interviews with engineering and construction companies who implemented cooperative partnering procurement procedures, Eriksson *et al*. (2009) identified that labor unions must be included in discussions surrounding any change to understand the benefits of their membership clearly.

Appoint Effective Change Agents to Lead the Transition

Perhaps the most important role during change implementation is that of the internal change agent (Wolpert, 2010). Within the organizational behavior literature, change agents are defined as the internal champions of the change that act as a "transition team" to guide the transition (Hunsucker & Loos, 1989; Kanter R. , 1983). This role is understood to be distinct from senior executive support, as change agents are expected to "roll up their sleeves" and be directly

involved in all aspects of change implementation (Self & Schraeder, 2009). Organizations are recommended to designate individuals to lead the change as part of their work responsibilities, and these change agents should be readily available to assist other employees both before and throughout the change (Covin & Kilmann, 1990; Schweiger & DeNisi, 1991).

In a case study of the several USA and Japanese contractors who implemented new web-based project management software, Dossick and Sakagami (2008) noted the importance of establishing a leader who acted to facilitate training, deliver communication, and enforce utilization. In an earlier study of the adoption of total quality management practices within seventeen owners, engineering firms, and contractors, Burati and Oswald (1993) specified the need for active involvement of middle management in addition to senior leadership commitment. Recent trends in BIM adoption have revealed that establishing a "master BIM manager" should be a major company, according to feedback from six BIM experts interviewed by Won and Lee (2013).

Establish Clear Performance Benchmarks to Quantify Progress

An important strategy for organizations to build momentum for a change initiative is to establish clear benchmarks of the desired results and then clearly document progress throughout the organization's transition. In his famous eight-step process for leading change, John Kotter (1995) recommends change managers to systematically plan for, create, and celebrate short-term wins, which both recognizes and rewards employees who actively participate in the change. Cameron and Quinn (1999) noted that public communication of successful results not only demonstrates visible performance improvement but also builds confidence among the organization's personnel. Other organizational behavior experts have noted that measurable successes serve to legitimize the appropriateness of the change (Walker *et al.* 2007).

In the highly competitive AEC industry, companies are obviously highly conscious of profits and have established entire systems of analysis to quantify project success, whether in terms of productivity, cash flow, risk, and margin, to name only a few. Naturally, the industry's longstanding tradition of being hyper profit-focused means that executives must deliberately identify how a change initiative will impact the bottom line and showcase the results throughout the transition. For example, a survey regarding BIM implementation within firms located in the United Kingdom noted that many firms struggled with the lack of immediate benefits from the initial set of projects they delivered (Eadiea, Brownea, Odeyinkaa, McKeowna, & Sean McNiffb, 2013). Another study found the top barrier to BIM implementation to stem from unclear and invalidated performance improvements (Lee *et al.* 2015). Similarly, construction firms that have implemented enterprise risk management systems reported a lack of quality data as a barrier to the change (Zhao, Hwang, Pheng Low, & Wu, 2015). Within the construction sector specifically, studies have found that workers are more stimulated to participate in innovation efforts when profits are shown to be maximized (Na *et al.* 2006).

Follow a Realistic Implementation Time-scale

Another behavioral aspect of organizational change is the rate of implementation (Rodgers, 2003). Even when an organization's personnel support the vision for a particular change, they may still resist the transition if they feel that management is pushing it at an unrealistic pace (Smollan, 2011). Organizational behavior experts have noted the benefit of planning for longer strategic time horizons rather than hoping for a "quick fix" approach to change adoption (Garratt, 1999; Tatum, 1989).

Isolated studies have revealed that AEC firms often underestimate the amount of time and associated resources required to accomplish a change, whether the organizational change in

question consists of the implementation of quality management programs (Sullivan, 2011), deployment of radio frequency identification technology (Li & Becerik-Gerber, 2011), application of various information and communication technologies (Peansupap & Walker, 2006), integration of risk management systems within public-private partnerships (Cheung & Loosemore, 2015), or implementation of knowledge management systems (Tan *et al.,* 2012).

Provide Sufficient Training Resources for Employees

A major cause of resistance to change occurs when organizations do not provide sufficient change-related training to their employees (Alvesson 2002, Schneider *et al.* 1994). Organizational behaviorists have long documented the psychological dynamics surrounding the effect of sufficient training resources on change recipients. For that example, Judson (1991) stated employees would worry that they personally may not be capable of changing how they operate within their daily job functions, and Galpin (1996) showed that appropriate levels of training become a key factor in building employee confidence in their ability to successfully adopt the change.

This is particularly true in the AEC industry, where companies are highly specialized, and each project requires unique technical solutions to be achieved. When new technology is introduced to AEC project teams, it is critical that they receive appropriate training to familiarize themselves with the tool and understand the process by which the technology should be utilized during project operations. For example, this has been shown to be critical for BIM integration (Bo and Chan 2012, Jensen *et al.* 2013, Khosrowshahi and Arayici 2012, Rogers *et al.* 2015). Yet the importance of training is not limited to technology-focused organizational changes and extends to all forms of management- or operations-based changes; for example, when companies first gain experience with alternative project delivery systems (such as design-build), they must build their project team's knowledge and skill sets in order to achieve success (Park, Ji, Lee, & Kim, 2009).

3.3 Methodology

Research Objectives and Anticipated Contribution

The objective of this study was to establish industry-wide relationships between prominent change management practices from the organizational behavior literature and the successful adoption of organizational change initiatives within the AEC industry. Further investigation focused on differences that may exist based upon AEC industry demographic groupings. A review of the previous literature revealed that although numerous organizational change studies have been conducted within the AEC industry, the existing body of knowledge is primarily limited to case studies of a small group of companies, a specific set of organizational change cases, or a particular country or another geographic region.

The contribution of this study is to formally demonstrate the influence of change management strategies across a robust sampling of AEC firms with particular emphasis on compiling a wide range of organizational change types. Demonstrating a relationship between specific change management practices and change adoption represents a contribution to practitioners by verifying that there are definitive strategies that AEC firms can use to adopt organizational change initiatives more successfully.

Definition of Variables

Leading change management practices were identified based on the literature review and selected due to their prevalence within the organizational behavior literature as well as their frequent, although disparate, presence across AEC literature case studies of organizational change. The specific definitions of each change management practice that were studied are included in Table 6, along with multiple measures for the dependent variable of change adoption. The change adoption measures were focused on quantifying the extent to which an organizational change was

successfully executed by the company. Within the survey questionnaire, the variables were measured on seven-point Likert-like scales (1=strongly agree, 2=agree, 3=somewhat agree, 4=neutral, 5=somewhat disagree, 6=disagree, 7=strongly disagree).

Table 6. Summary of Change Management Practices and Organizational Change Adoption Measures

Chg. Mgmt. Practice Abbreviation	Definition
Communicated Benefits	Employees had a clear understanding of how the organizational change benefited them personally within their specific job function.
Senior Leadership Commitment	The organization's senior leadership were committed to the organizational change initiative ("walked the talk").
Realistic Time-scale	The speed at which the organization implemented the change was appropriate and achievable.
Training Resources	Employees had a clear understanding of the action steps necessary to implement the change within their specific job function.
Change Agent Effectiveness	The change agents responsible for leading and managing the change initiative were effective.
Measured Benchmarks	The organization established clear benchmarks to evaluate the success of the change initiative (in relation to previous performance).
Change Adoption Abbreviation	**Definition**
Sustained Long-Term	Organizational change adoption was sustained long-term within the company's operations (three or more years).
Produced Beneficial Impacts	Organizational change adoption resulted in a positive or beneficial impact on the organization.
Achieved Desired Goals	Organizational change adoption achieved the desired outcomes within the organization's operations.
Change Adoption Construct	Overall organizational change adoption, measured as the linear composite of the optimally weighted change adoption variables.

Questionnaire Design

The questionnaire was created using an online survey tool due to the accessibility of online survey tools and ease of reaching large numbers of participants. First, a pilot questionnaire was created and distributed to twenty-three participants via e-mail. A teleconference discussion was conducted to present a review of the questions within the pilot survey. Minor changes were suggested by the pilot questionnaire participants and were incorporated to refine the final questionnaire.

Once the questionnaire was reviewed and finalized, a standard e-mail template was created providing information about the research and consent request was included as part of the e-mail as well as the first section of the online survey itself. The survey questionnaire consisted of two additional sections. The first section was framed around the main research question and captured scales for six change implementation independent variables along with three scales measuring the change adoption dependent variable. The second section asked standard questions regarding the respondent's demographics, including their company's size and mode of business as well as the individual respondent's years of experience and hierarchical position within their organization.

To meet the study objectives, it was necessary to gather data from a broad section of the AEC industry; therefore, a wide selection of architecture, engineering, construction, and owner organizations was included. Survey respondents were contacted by distributing via the mailing lists of multiple professional organizations representing a broad spectrum of the AEC industry, including Fiatech, Process Industry Practices (PIP), Mechanical Contractors Association of America (MCAA), In Eight, and Engineering News-Record (ENR). The snowball approach to sampling was utilized, which requested recipients to forward the survey web-link to their colleagues in the industry; therefore, the exact number of survey questionnaires distributed cannot be established, and the traditional response rate cannot be calculated (Muller and Turner 2007). E-mail distribution occurred over a two-week period with a three-week cutoff period for responses.

Hypothesis Statements

The relationship between change management practices and the successful adoption of organizational change initiatives has long been established in the organizational behavior literature. Yet within the AEC industry specifically, these relationships have mainly been discussed within the context of case studies of narrow scope or for specific types of organizational

change initiatives. The objective of this study was to collect a broad sample organizational change initiatives from the AEC industry and investigate the relationship between leading change management practices and change adoption. In order to investigate these relationships, the following hypotheses were investigated as shown in Table 7 (graphically summarized in Fig.2). Note that each hypothesis was subdivided into four components to thoroughly establish relationships of change management practices with each measure of change adoption, including (a) Sustained Long-Term, (b) Produced Beneficial Impacts, (c) Achieved Desired Goals, and (d) the Change Adoption Construct.

Table 7. Summary of Hypothesis Statements

Independent variables	Dependent variables
a) Communicated Benefits b) Senior Leadership Commitment c) Realistic Time-scale d) Sufficient Training Resources e) Change Agent Effectiveness f) Measured Benchmarks	1. Sustained Long-Term
	2. Produced Beneficial Impacts
	3. Achieved Desired Goals
	4. Change Adoption Construct

Hypothesis 1a, 1b, 1c, 1d were described below as an example of the hypothesis statements from Table 7.

Hypothesis 1. H1a

There is a statistically significant positive relationship between the extent to which AEC organizations Communicated Benefits of the organizational change and Sustained Long-Term.

Hypothesis 1. H1b

There is a statistically significant positive relationship between the extent to which AEC organizations Communicated Benefits of the organizational change and Produced Beneficial Impacts.

Hypothesis 1. H1c

There is a statistically significant positive relationship between the extent to which AEC organizations Communicated Benefits of the organizational change and Achieved Desired Goals.

Hypothesis 1. H1d

There is a statistically significant positive relationship between the extent to which AEC organizations Communicated Benefits of the organizational change and the Change Adoption Construct.

Similarly, H2a, H2b, H2c, H2d, H3a, H3b, H3c, H3d, H4a, H4b, H4c, H4d, H5a, H5b, H5c, H5d, H6a, H6b, H6c, and H6d hypothesis can be developed.

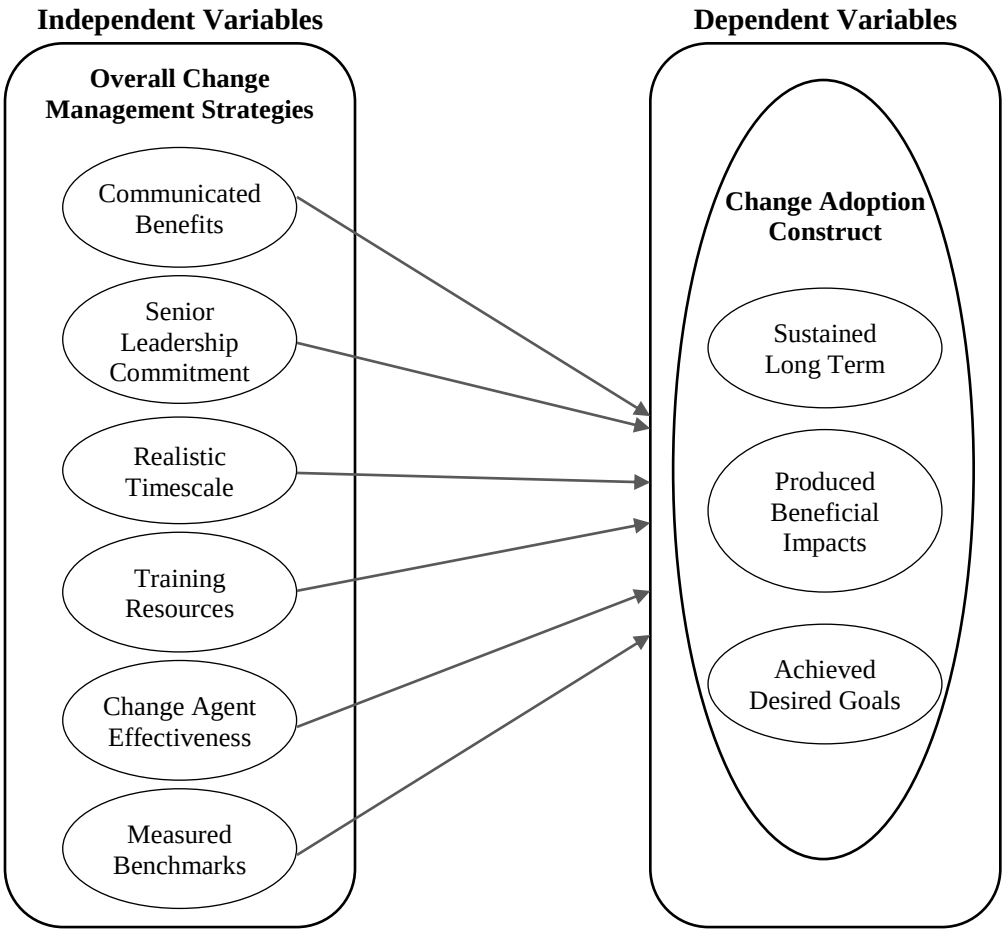

Figure 2. Graphical Representation of Study Hypothesis

Method of Analysis

A graphical representation of the research design is shown in Fig.3. After identifying leading change management practices, pilot testing the questionnaire, and broadly disseminating the final questionnaire, the data set was analyzed in multiple steps. First, Spearman's rank-order correlation was used to establish the direction and extent of the bivariate relationships between individual change management practices and change adoption measures. Second, multiple OLR was performed to investigate the total variance in change adoption that was explained by the change management practices used in collaboration. Third, a more refined correlation analysis was performed based upon demographic subsections of the study sample.

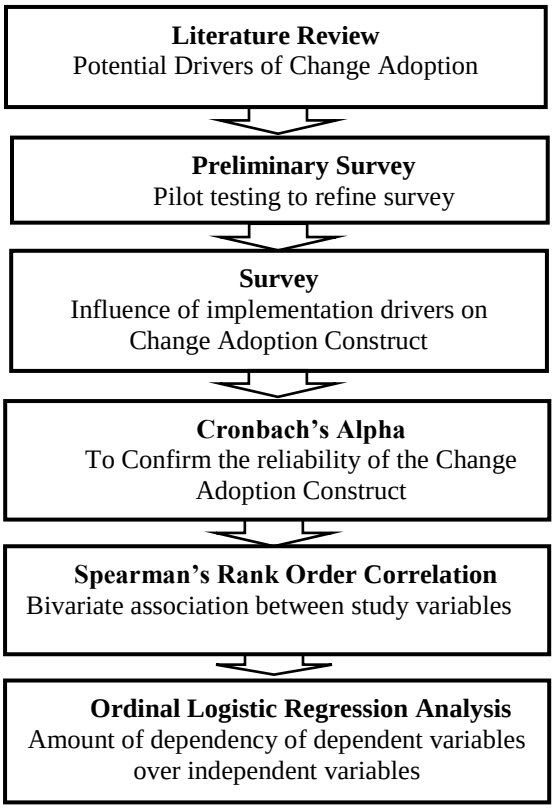

Figure 3. Graphical Representation of Research Design

Study Sample

The questionnaire was designed such that each response represented an organization-wide change initiative. This unit of measure was purposely designed to maintain consistency with the research objective of establishing change management relationships across a broad sample that included numerous types of organizational change initiatives.

A total of 237 organizational change initiatives were collected, and a sampling of the types of initiatives captured within this study are listed in Table 8. Based on its size and variety, the sample was considered to be a fairly accurate representation of the dynamics of the organizational change initiatives found within the modern AEC industry.

Table 8. Examples of the Organizational Change Initiatives Captured within the Data Sample

- Lean Implementation	- Supplier Relations Management
- BIM Adoption	- Change in Marketing Strategy
- Industrialized Construction	- Smart Plant Implementation
- Project Controls Technology	- Formal Project Management Systems
- Project Management Software	- Customer Relationship Mgmt. System
- Enterprise Resource Planning	- Business Structure Reorganization
- Materials Tracking Upgrades	- Knowledge Management Systems
- Document Mgmt. Systems	- Enterprise Risk Management
- Radio Frequency Identification (RFID)	- Alternative Procurement Procedures
- Safety Management Programs	- And much more.

Respondent characteristics are summarized in Table 9, which shows that a range of AEC organization types and sizes were represented in the data sample and the majority of respondents held more than twenty years of experience.

Table 9. Survey Respondent Characteristics

Organization Size (gross revenue)	**Frequency**	**Percentage**
<30 Million	29	12.3%
30 Million – 99 Million	25	10.6%
100 Million – 499 Million	29	12.3%
>500 Million	81	34.3%
Unknown / Not Indicated	72	30.5%
Organization Type	**Frequency**	**Percentage**
Owner	109	46%
Contractor	45	19%
Architecture / Engineering	35	14.8%
Unknown / Not Indicated	48	20.2%
Hierarchical Position	**Frequency**	**Percentage**
Project Team	24	10.1%
Project Leader	51	21.5%
Manager / Director	71	30.0%
Senior Executive	46	19.4%
Unknown / Not Indicated	45	19.0%
Years of Professional AEC Experience	**Frequency**	**Percentage**
0 – 10 years	8	3.4%
10 – 20 years	26	11.0%
20 – 30 years	71	30.0%
30 – 40 years	73	30.8%
40+ years	25	10.5%
Unknown / Not Indicated	34	14.3%

3.4 Results

The results are divided into four sections. First, the reliability of the Change Adoption Construct is confirmed. Second, the correlation results are investigated to establish the bivariate relationship between change management practices and change adoption within the AEC industry. Next, OLR is presented to determine how well the model predicts the successful change adoption and to determine the odds ratios of the independent variables relating to the dependent variables. Finally, correlation analysis is revisited to investigate change adoption trends based upon demographic segments of the AEC industry.

Reliability of the Change Adoption Construct

The internal reliability was investigated for the Change Adoption Construct. The alpha coefficient value was above the acceptable threshold of 0.7 (DeVillis 2003, Kline 2005). A Principal Component Analysis (PCA) with varimax rotation was performed to establish the Change Adoption Construct. Inspection of the correlation matrix showed all variables had at least one correlation coefficient greater than the 0.3 thresholds. The overall Kaiser-Meyer-Olkin measure was 0.653, which is classified as "mediocre" according to Kaiser (1974). The individual values of Kaiser-Meyer-Olkin (KMO) measure of every variable was greater than 0.6, and Bartlett's test of Sphericity was statistically significant ($p<.001$) as shown in Table 10, indicating that the data was likely factorable. A single factor was extracted based on visual inspection of the scree plot, which revealed only a single point above the inflection point, which was supported by results of the varimax orthogonal rotation. Based on this, a single factor was established, comprised of the variables Sustained Long-Term, Produced Beneficial Impacts, and Achieved Desired Goals. The resulting component score was termed the Change Adoption Construct and consisted of the linear composite of the optimally weighted original variables.

Table 10. Communalities of Extracted Components in PCA

	Initial	Extraction	Extracted Component
Sustained Long-Term	1	0.588	.912
Achieved Desired Goals	1	0.833	.881
Produced Beneficial Impacts	1	0.776	.767

Note: Extraction Method: Principal Component Analysis, Varimax rotation, Kaiser-Meyer-Olkin measure of sampling adequacy was 0.653, Bartlett's test of Sphericity Chi 279.81, df 3, $p<0.05$.

Bivariate Relationships between Change Management Practices and Change Adoption

Spearman's rank-order correlation was utilized to assess the bivariate relationships between the change management practices and the various measures of change adoption. Preliminary

analysis showed the relationships to be monotonic, as assessed by visual inspection of scatter plots. Results of the correlation matrix are shown in Table 11. All of the research hypotheses were supported. Statistically significant relationships between the independent variables and the change adoption measures were found at the 99% confidence interval.

Focusing on the Change Adoption Construct, a strong positive correlation existed with Change Agent Effectiveness (r_s =.714, p<.01) and moderate positive relationships were found for the remaining independent variables of Communicated Benefits (r_s =.659, p<.01), Realistic Time-scale (r_s =.544, p<.01), Senior Leadership Commitment (r_s =.510, p<.01), Measured Benchmarks (r_s =.603, p<.01), and Training Resources (r_s =.476, p<.01). Interpretation of association strength was based on guidelines recommended by Keller and Warrack (2000) and Lehtiranta *et al.* (2012).

Investigation of individual measures of change adoption (Sustained Long-Term, Produced Beneficial Impacts, and Achieved Desired Goals) revealed the bivariate results to be largely consistent with the Change Adoption Construction results reported above. However, minor changes in relative importance of the independent variables were found; for example, Senior Leadership Commitment had the strongest relationship with an organization's ability to ensure that the change initiative was Sustained Long-Term; whereas it was only the fifth strongest relationship with the overall Change Adoption Construct.

Table 11. Spearman Correlation of Independent and Dependent variables

No.	Variable Abbreviation	1	2	3	4	5	6	A	B	C	D
1	Communicated Benefits	1.000									
2	Senior Leadership Commitment	.439	1.000								
3	Realistic Time-scale	.544	.474	1.000							
4	Training Resources	.620	.317	.547	1.000						
5	Change Agent Effectiveness	.628	.491	.627	.566	1.000					
6	Measured Benchmarks	.518	.450	.472	.490	.565	1.000				
A	Sustained Long-Term	.384[1a]	.405[2a]	.330[3a]	.283[4a]	.380[5a]	.353[6a]	1.000			
B	Achieved Goals	.634[1b]	.450[2b]	.580[3b]	.442[4b]	.687[5b]	.547[6b]	.509	1.000		
C	Produced Beneficial Impacts	.634[1c]	.467[2c]	.487[3c]	.515[4c]	.691[5c]	.603[6c]	.462	.741	1.000	
D	Change Adoption Construct	.659[1d]	.510[2d]	.544[3d]	.476[4d]	.714[5d]	.603[6d]	.685	.913	.887	1.000

Notes: Correlation was significant at the 0.01 (2-tailed) level for all variables
Bivariate association with specific study hypotheses shown below:

[1a, 1b, 1c, 1d] Hypothesis 1
[2a, 2b, 2c, 2d] Hypothesis 2
[3a, 3b, 3c, 3d] Hypothesis 3
[4a. 4b, 4c, 4d] Hypothesis 4
[5a, 5b, 5c, 5d] Hypothesis 5
[6a, 6b, 6c, 6d] Hypothesis 6

Table 12. Summary results of Ordinal Logistic Regression Analysis

	Sustained Long-Term	Achieved Desired Goals	Produced Beneficial Impacts	Change Adoption Construct
Cox and Snell Pseudo-R^2	.179	.438	.417	.516
Nagelkerke Pseudo-R^2	.289	.569	.535	.581
McFadden Pseudo-R^2	.205	.393	.357	.331
Deviance Goodness-of-Fit Test (p>.05 indicates the model is a good fit)	83.096 (p=.999)	106.32 (p=.919)	119.802 (p= 0.685)	81.219 (p=.997)
Likelihood-Ratio Test (p<.05 indicates fit above the intercept-only model	42.437 (p<.05)	123.184 (p<.05)	39.518 (p<.05)	135.229 (p<.05)

Ordinal Regression of Change Management Practices and Change Adoption

Ordinal logistic regression tests were conducted to explore the collected data further and validate inferences gained from correlation results. Separate ordinal logistic regressions were performed between all change management practices and each of change adoption measure. Three pseudo-R^2 measures were assessed for each model to identify the variance explained, revealing that the change management practices collectively defined between 17.9% and 58.1% of the variance in change adoption (Table 12). For each regression, there were proportional odds as assessed by a full-likelihood ratio test comparing each model with varying location parameters. The deviance goodness-of-fit test indicated each model to be a good fit for the observed data, and all models were statistically significant over the intercept-only models as shown by the likelihood-ratio test.

Notable statistically significant parameter estimates are reported below for each ordinal regression, with emphasis on differences between the change adoption results achieved by organizations that agreed vs. disagreed that their organization effectively performed each change management practice. For the Change Adoption Construct, the odds that an organization achieved a successful change adoption was twenty times more likely when the benefits of the change were thoroughly explained (p=.001). Establishing quantifiable performance metrics improved the odds of successful organizational change adoption sevenfold. When effective change agents were present to manage the change effort, the organization was seven times more likely to adopt the change (p=.001). When the organization established clear benchmarks to evaluate the change initiative's success, the organization was seven times more likely to achieve successful change adoption (p=.000). Organizations that followed a realistic implementation plan were four times more likely to adopt the change successfully. Organizations with visible senior leadership commitment throughout the change were four times more likely to be successful (p=.020).

When considering the effect of change management practices on individual measures of change adoption, parameter estimates from ordinal logistic regressions revealed several notable results. For the dependent variable of Sustained Long-Term, the establishment of clear performance benchmarks was found to have the greatest odds ratio among the change management practices, such that organizations that established clear measurements of the change initiative were nearly four times more likely to adopt the change in their long-term operations (p=.017). For the measure of Achieved Desired Goals, senior leadership commitment was the greatest odds ratio, resulting in a rate of successful goal achievement eleven times larger (p=.001) than organizations without visible senior leadership commitment. Furthermore, the second-greatest odds ratio for Achieved Desired Goals was the presence of effective change agents (p=.022), which highlights the importance of leadership skills in managing change. For the dependent variable Produced Beneficial Impacts, organizations with senior leadership commitment had nearly six times greater change adoption rate (p=.008) Organizations established clear benchmarks were four times more successful (p=.001). The presence of effective change enabled organizations to be four times more likely to achieve their desired performance improvements.

Demographic Trends and Change Adoption

Correlation analysis was performed between the Change Adoption Construct and the independent variables based upon the various demographic characteristics of the survey respondents, and the results are summarized in Table 13.

Organizational Size. Respondents from organizations with gross revenues greater than $30 million appeared to agree on the relationship between the various change management practices and their ability to positively influence change adoption. Yet smaller organizations differed in several instances. For example, smaller organizations found a stronger relationship between both senior

leadership commitment and change agent effectiveness and the successful adoption of organizational change initiatives. This effect can perhaps be explained in the sense that smaller organizational size may provide individual leaders with greater ability to extend their influence across the organization.

Organizational Type. Correlation results appeared to indicate that different organizations within the AEC industry–such as Owners, Contractors, and Designers–were highly consistent in the relationship between change management practices and change adoption.

Hierarchical Position. According to senior personnel (at the level of CEO, President, etc.) senior leadership commitment was found to be a relatively unimportant factor in adopting change within an organization (r_s=.410, p<0.001). Conversely, results revealed that the further down the organizational hierarchy, the more important Senior Leadership Commitment was perceived to be in adopting organizational change, with project team perspective showing a strong relationship (r_s=.634, p<0.001). Project teams strongly believed that sufficient training resources were critical in adopting change (r_s=.737, p<0.001), whereas no other members of the organization agreed, perhaps indicating that training of technical skills within a change is most critical for the employees who will experience the greatest impact on their daily job functions.

Years of Professional Experience. Several trends were identified based upon respondent experience. Early career professionals believed Senior Leadership (r_s=.839, p<0.05) and Training Resources (r_s=.764, p<0.05) to have a strong positive relationship with the Change Adoption Construct. As the experience levels increased, the correlation coefficient for these variables decreased considerably. More experienced personnel most strongly felt that change agent effectiveness was strongly associated with the Change Adoption Construct.

Table 13. Summarized Correlation Analysis for the Change Adoption Construct Based on Respondent Demographics

Category	Comm. Benefits	Sr. Leader. Commitment	Realistic Time-scale	Training Resources	Change Agent Effect.	Measured Benchmarks
Organizational Size						
<30M	.796**	.612**	.599**	.549**	.786**	.654**
30M – 99 M	.671**	.502*	.588**	.546**	.742**	.424*
100M – 500M	.772**	.678**	.693**	.564**	.700**	.596**
500M+	.587**	.330**	.338**	.355**	.622**	.569**
Organizational Type						
Owner	.758**	.511**	.547**	.477**	.764**	.641**
Contractor	.559**	.333*	.546**	.379*	.565**	.482**
Architect / Engineer	.639**	.403*	.356*	.324	.678**	.596**
Hierarchal Position						
Project Team	.856**	.634**	.651**	.737**	.717**	.711**
Project Leader	.630**	.514**	.444**	.344*	.632**	.616**
Manager / Director	.722**	.457**	.481**	.387**	.777**	.490**
Senior Personnel	.545**	.410**	.601**	.434**	.653**	.647**
Years of Professional Experience						
0 – 10 years	.759*	.839*	.591	.764*	.261	.606
10 – 20 years	.747**	.489*	.361	.522**	.730**	.512**
20 – 30 years	.694**	.353**	.326**	.301*	.514**	.453**
30 – 40 years	.689**	.522**	.646**	.542**	.780**	.677**
40+ years	.670**	.681**	.649**	.306	.810**	.721**

*Correlation is significant at the 0.05 level
**Correlation is significant at the 0.01 level

3.5 Discussion

Influence of Change Management Practices on Change Adoption

The positive bivariate correlations between all change management practices and each measure of change adoption are consistent with both the organizational behavior literature as well as the numerous case-based research of organizational change initiatives within the AEC industry. These results, coupled with the fact that OLR results explained as much as 58.1% of the variance in change adoption, confirm the study hypotheses. Based upon bivariate statistical relationships, the participation of effective change agents was found to have the strongest relationship with achieving successful change. This was followed closely by thorough communication to employees of how the

organizational change would benefit them personally within their specific job function. Somewhat surprisingly, the least important of the change management practices studies was the provision of sufficient training resources to teach employees the technical skills to implement the change (although it still had a moderately statistically significant relationship with change adoption).

Even when separate measures of change adoption were isolated, the relative importance of the change management practices was largely consistent. However, one notable area of deviation was that senior leadership commitment held the strongest relationship with sustaining the organizational change over the long-term, whereas senior leadership was among the least relatively important change management practices in the other change adoption measures. This finding is perhaps a reflection that senior leaders hold a critical role in demonstrating that the change is not simply a "flavor of the month" but rather that the organization is dedicated to making the transition.

Demographic Implications

The uniformity of the results across various organization types indicates that organizational change dynamics across the industry are fairly consistent. This is logical when considering that each of the major organizational types represents a key stakeholder within the project-based environment of the AEC industry, and these stakeholders regularly experience similar challenges to one another when facing change. The organizational size was found to be a more important indicator in re-prioritizing the relative importance of change management practices, with smaller organizations experiencing the greater influence of senior leaders and change agents.

Demographic trends identified a potential communication breakdown within the AEC organizational hierarchy. Senior leaders placed the least emphasis on the importance that their visible commitment has on influencing change adoption, whereas both lower level personnel and less experienced personnel felt that senior leadership commitment was strongly important for successful

change adoption. It is possible that senior leaders may feel as though they are unable to "force" the organization to change, whereas lower level personnel (project team members, early career professionals) are inclined to look to executives for leadership during an organizational transition. Senior leaders are recommended to keep this in mind and be sure to emphasize their commitment through appropriate channels across the organization. Another demographically=based finding was that more experienced professionals felt that effective change agents are essential to change adoption, whereas early career professionals yearned for the more detailed training of the technical skills and actions steps necessary to enact a change.

3.6 Conclusion

The objective of this study was to conduct a global, industry-wide survey to address the research question: How are some AEC firms able to more effectively implement organizational change initiatives while other firms are less successful? A global sample of AEC change initiatives was collected, and results of this study suggest there are definitive–and learnable–change management practices that firms across the AEC industry can implement to more successfully adopt change.

Contributions

The global data sample within this study is a meaningful contribution to the AEC literature, which is primarily restricted to case-based studies with limited data sets that focus on a single type of organizational change within only a few (or one) organization. This design of this study provides empirical evidence of the relationship between leading change management practices found in the organizational behavior literature and the successful adoption of change within AEC companies. The unit of measure of the study was such that each data point (N=237) represented an entire organization-wide change within an AEC company. The numerous distinct types of change

initiatives captured within the data sample support broad applicability of the findings across the wide variety of change events experienced in the modern AEC marketplace.

The study results contribute practical implications for AEC firms. First, this study demonstrates that achieving successful change adoption is as much–or even more–dependent on the "soft skills" of change management as the technical skills of learning to implement the change within the organization's operations. In other words, organizational change adoption is as much about the "hearts and minds" of employees as it is about the "nuts and bolts" of the change itself. Second, effective change management strategies are learnable skills. Each change management practice investigated within this study consists of actionable steps that industry professionals can take to improve their chances of successful change adoption.

Limitations and Recommendations for Future Research

Several study limitations were identified along with suggested areas of future research. First, this study was limited to six leading change management practices identified within the organizational behavior literature. Although these practices collected explained up to 58.1% of the variance in change adoption, substantial variance was left unexplained. It is therefore acknowledged that other factors are likely to contribute to successful change adoption, such as environmental factors, organizational culture, broader industry trends, global economic conditions, etc. Future research may investigate additional change management practices and perhaps even identify certain change management practices that are unique to the AEC industry that may not have been identified in organizational behavior literature.

Second, the global nature of the study did not account for regional, national, or other geographically-based differences in organizational change dynamics. Further, the questionnaire was

only administered in English, and as such native English speakers may have had an advantage over non-native English speakers when responding to the study.

Third, this study was based upon self-report responses, which may be affected by participant biases or inability to recall a past situation's attributes accurately. Future research may be designed to collect multiple responses from each organization in order to more accurately and thoroughly capture perspectives from across the organization.

Another limitation was that the sampling technique allowed respondents to choose whether they reported a successful or unsuccessful organizational change initiative. Analysis of the study sample revealed that respondents more frequently chose to report successful change initiatives by a slight margin. Two suggestions for future study designs come to mind. First, the sampling technique could designate whether each individual respondent is being asked to submit a successful or unsuccessful change, thereby specifically selecting for both extremes. Second, future studies may consider a sampling design whereby each participating organization is required to submit both a successful and unsuccessful change. This would enable the researchers to better control for environmental variables (such as organizational culture, geographic region, type of business, organizational size, etc.) and better focus on the change management practices that were taken during each change initiative.

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CHAPTER 4: EMPLOYEE REACTIONS TO ORGANIZATIONAL CHANGE ADOPTION WITHIN DESIGN AND CONSTRUCTION FIRMS: AN INDUSTRY-WIDE SURVEY

Abstract: The construction industry is one of the few industry sectors to have seen a decrease in productivity in recent years, as measured by the United State Bureau of Labor Statistics. This trend is surprising considering the variety of modern methods of construction in the marketplace, such as new software and other technologies, management innovations, and supply chain optimization. Previous research has indicated that numerous barriers can hinder design and construction firms from adopting modern methods of construction. Some researchers have suggested that the design and construction industry – when taken as a whole – may simply be more resistant to change than other industry sectors; however, this has not been investigated in detail. To address this gap in the literature, the objective of this study was to identify how employees within design and construction firms react to organizational change initiatives and whether these reactions mediated the firm's change management approaches and change adoption outcomes. A survey of design and construction firms was used to quantify measures of employee reactions, change management practices, and change adoption outcomes for 165 separate change initiatives within design and construction firms internationally. Results indicated that although they may react on a wide behavioral continuum, individual employees within the design and construction industry are far more supportive than resistive of change, with nearly two-thirds of employees displaying change-accepting behaviors. The most successful change initiatives experienced more supportive reactions to change, with approximately 10 percent more employee reactions categorized as being strongly supportive when compared to the industry average (and 20 percent more than the least successful change initiatives measured in the study). A key contribution of this study is the fact that seemingly small increases in employee support for can have a substantial impact on change adoption success.

4.1 Introduction

Organizational change is necessary for businesses to remain competitive in today's market. The construction industry is one of the few industry sectors to have seen a decrease in productivity in recent years, as measured by the United State Bureau of Labor Statistics (Teicholz *et al.*, 2001). Teicholz *et al.* (2001) reviewed labor productivity trends in the construction industry over past three decades and found that the labor productivity trend had continued to slowly decline at compound rate of -0.48%. Conversely, other industries (such as manufacturing) have shown an increasing labor productivity of 1.71% per year over the time period of 1964 to 1999 based on data collected annually by US Bureau of Labor Statistics. Allen's (1985) research concluded that the labor productivity has declined at the rate of -0.46% per every year during the period of 1968 to 1978. The possible factors mentioned by Teicholz *et al.* for declining labor productivity include 1) inadequate training for workers 2) entry level workers 3) more safety procedures 4) increased complexity of projects 5) time pressure and 6) fragmentation of work process. Thereafter, labor productivity trend showed a decline of -1.49% from 2005 to 2014 (Eldridge & Price, 2016). According to Bureau of Labor Statistics, it was observed a negative productivity growth every decade from 1967. However, the productivity decline during recent decades yet to be fully explained. These productivity statistics indicate the importance for design and construction firms to become successful change adopters, because organizational change initiatives are a main avenue for firms to implement productivity improvements within their operations.

Firms that have experienced an effective adoption in updating their technology and business practices make them more competitive in the AEC industry. Regardless of change, AEC firms that efficiently manage organizational change adoption place themselves as early change adaptors. To have an efficient organizational change, organizations should strive to create favorable employee

reactions and attitudes towards the change (Lines *et al.* 2016). The willingness of some employees to change accelerates the process of implementation. But not everyone in the organization is expected to react to the change in a positive way. Some employees in an organization might resist change due to their reasons. Such employees would be most likely to resist the process of implementation in the organization. These inconsistent reactions of employees in AEC industry raised a fundamental question: a) How do employees within AEC firms react to organizational change and b) Does employees' reactions to change adoption affect the process of organizational change implementation?

The primary objective of this study was to examine the relationship between employee reactions to change and the success rate of organizational change adoption. It was widely recognized that reactions of employees somehow affect change adoption in the past AEC literature. To accomplish this objective, this study conducted a survey globally and obtained 165 responses where each case stands for a single organizational change event within AEC firms. Interviews with industry professionals also established case studies of organizational change reactions in five separate organizations, each of which underwent a different type of organizational change. The results of this study are intended to identify the extent to which the AEC industry reacts favorably (or unfavorably) towards organizational change events when compared with other industries. The moderating effect that employee reactions to change have on change adoption will also was also investigated.

4.2 Literature Review

The literature review was conducted by focusing on the employee reactions to the organizational change from the field of organizational behavior. These reactions of employee were then coupled with examples of where they have been documented within the AEC literature. As stated earlier, it should be noted that the AEC literature is primarily limited to case studies and

relatively small data sets focused on a singular organizational change initiatives, which further motivated the interdisciplinary approach to the literature review.

Employee Reactions Organizational Change Implementation

Employees react to organizational change based on many factors, making it important to know the impact of employee reactions and the causes behind them (Bovey & Hede, 2001b). Herscovitch and Meyer (2002) observed a continuum of favorable reactions to unfavorable reactions including specific categories such as active resistance, passive resistance, compliance, cooperation, and championing. Lines (2005) found that a range of behaviors could be identified including "positive or negative toward the change" and "strong or weak behaviors."

Change acceptance by employees includes favorable reactions towards change and willingness of an employee to change (Jaros, 2010). Kim *et al.* (2011) defined change favorable reaction as the employee action to engage in active participation and contribute to the process of change implementation planned by an organization. Herscovitch & Meyer (2002) researched on employee commitment to organizational change by measuring commitment in the terms of change favorable behavior such as employee compliance, cooperation and championing behavior of employees.

Employee resistance is one of the leading causes for the failure of change initiatives (Bovey & Hede, 2001b; Waldersee & Griffiths, 1996; Maurer, 1997). Resistance to organizational change was defined as a form of dissent to a process of organizational change (Giangreco & Peccei, 2005). Bolognese (2002) categorized resistance into two 1) Active resistance which includes finding fault, ridiculing, appealing to fear, and manipulating 2) Passive resistance which includes agreeing verbally but not following through, feigning ignorance and withholding information. Giangreco and Peccei (2005) researched on mid-level managers and found that anti-change behaviors were

frequently expressed in passive rather than overt ways. Resistance does not necessarily increase with larger organizations (Armenakis & Bedeian, 1999). Smollan's (2011) empirical analysis showed that organizational employees at different hierarchical levels were all susceptible to resisting change.

This study focused mainly on behavioral resistance due to change ranging from Actively Supporting to Actively Opposing and is shown in Table 14, based on definitions from the literature (Bovey & Hede, 2001a; Bovey & Hede, 2001b; Emiliani & Stec, 2005; Giangreco & Peccei, 2005; Fiedler, 2010; Lines *etal.*, 2015).

Table 14. Definitions of Employee Reaction Types

Region	Spectrum of Employee Reactions	Definition of Observable Employee Reactions
Favorable Reactions	Championing	Initiating and embracing the change in the organization
	Actively Supporting	Supporting the change within the organization
	Passively Supporting	Accepting with the change
	Reluctantly Complying	Just going with the change
Unfavorable Reactions	Passively Avoiding	Ignoring, withdrawing, avoiding the change
	Openly Not Participating	Refraining, waiting, observing the change
	Covertly Opposing	Stalling, dismantling, undermining the change
	Overtly Opposing	Obstructing, opposing, arguing the change

Within the AEC literature, resistance is often mentioned as one of the barriers to implement change (Ozorhon, 2014; Ozorhon *et al.*, 2014; Henderson & Ruikar, 2010). Ozorhon (2014) studied on four different case studies in the UK and suggested that employees overcoming the reluctance to change is the main driver to have a successful adoption in an organization.

Rogers (2003) studied how human populations respond to and adopt change in the form of new technology, which was widely considered as a landmark study in the area of organizational change adoption. Rogers (2003) defined the rate of adoption as "the relative speed with which an innovation is adopted by members of a social system." Individuals were classified into five categories based on their reaction to change, which were titled as innovators, early adopters, early majority, late majority, and laggards. Innovators were defined as the individuals willing to experience new ideas, early adopters are more limited with the boundaries of the system. The early

majority have good interaction with individuals of the system but does not have a leadership role as early adopters. The late majority waits until most of their peers adopt innovation before favorably participating, and laggards have a traditional view of innovation and remain more skeptical about the change events.

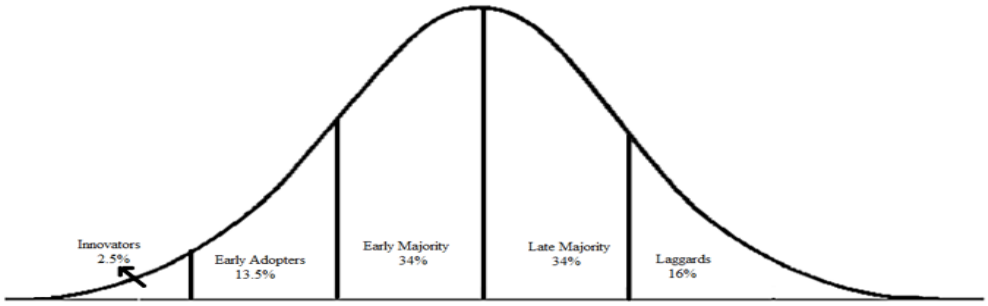

Figure 4. Rogers (2003) Diffusion of Innovation

Rogers (2003) prepared a bell curve (Fig.4) of the normal distribution on the basis of these five categories of people. From this bell curve, it was concluded that innovators adopt the innovation as first 2.5% of the other individuals in the industry. The early adopters (13.5%) and early majority (34%) were lying on left side of the curve and late majority (34%), laggards (16%) were lying on the right extreme of the bell curve.

Communicating Organizational Change

Past studies in both AEC and organizational behavior literature have focused on organizational change adoption. Holt *et al*. (2003) found that, although senior leaders are the ones who initiate major organizational change, first-line supervisors are responsible for communicating and implementing it at the operational level. Kanter *et al.* (1992) developed Ten Commandments for executing change, which includes communicating openly about the change to the people involved in the process of implementation. Luecke (2003) concluded that leaders should be very specific about the benefits and importance of the change to the organization.

Within the AEC literature, previous studies investigated methods for communicating the change message throughout the organization. Pheng and Hui (2005) studied implementing Six Sigma in an organization and suggested, training program for employees as an essential factor in the process of implementing change. Communicating the change message to employees through memos, newsletters, or bulletin boards was strongly suggested by Singh and Shoura (1999). Lai *et al.* (2011) interviewed seventy industrial professionals in the USA and Singapore whose companies implemented safety management programs and suggested developing communication with employees and getting feedback occasionally.

4.3 Research Questions and Hypothesis Statements

Research Questions

1. What is the spectrum of employee reactions to organizational change initiatives within the AEC industry?
2. Do employee reactions mediate the relationship between change management actions and change adoption?

Hypothesis Statements

H1: There is a statistically significant relationship between the change management strategies employed by an organization and organizations' members' reactions to the change.

H2: There is a statistically significant relationship between the employee reactions and change adoption.

H3: Employee reactions mediate the relationship between change management actions and change adoption.

4.4 Data Collection

As mentioned in the previous chapter, a questionnaire survey was prepared using an online survey tool and sent to most of the AEC and owner firms. As a result of this survey, a total of 165 responses were collected from AEC industry professionals. Table 15 presents a summary of respondent demographics.

Table 15. Summary of Survey Responses

Criteria		**Number of cases**
Survey responses		165
Interview Responses		5
Organization Size (gross revenue)	**Frequency**	**Percentage**
<30 Million	29	12.3%
30 Million – 99 Million	25	10.6%
100 Million – 499 Million	29	12.3%
>500 Million	81	34.3%
Unknown / Not Indicated	72	30.5%
Organization Type	**Frequency**	**Percentage**
Owner	109	46%
Contractor	45	19%
Architecture / Engineering	35	14.8%
Unknown / Not Indicated	48	20.2%
Hierarchical Position	**Frequency**	**Percentage**
Project Team	24	10.1%
Project Leader	51	21.5%
Manager / Director	71	30.0%
Senior Executive	46	19.4%
Unknown / Not Indicated	45	19.0%
Years of Professional AEC Experience	**Frequency**	**Percentage**
0 – 10 years	8	3.4%
10 – 20 years	26	11.0%
20 – 30 years	71	30.0%
30 – 40 years	73	30.8%
40+ years	25	10.5%
Unknown / Not Indicated	34	14.3%

Ninety-one respondents volunteered for a follow-up interview and responded with their contact details, what change initiative occurred in their organization, what barriers they faced, and which change management drivers that were used to overcome those barriers. Ten respondents were

selected based on their organization's level of successful change adoption as measured via the Change Adoption Construct. Emails were sent to these selected respondents scheduling an appointment for an interview. Five of these respondents replied with appointment confirmation and were interviewed (due to their availability of time).

4.5 Method of Analysis

Respondents expressed their responses on the top three reactions to change by employees and the top three ways of communicating a change in an organization. As previously defined in Table 14, reactions were measured on a nine-point Likert scale with 1=Championing, 2=Actively Supporting, 3=Passively Agreeing, 4=Reluctantly Complying with Change, 5=Ignoring or withdrawing, 6=Openly Not Participating, 7=Covertly Opposing, and 8=Openly Opposing. The average score for the selected top three reactions per organization was calculated and tested for the Change Adoption Construct to assess the Mediation Effect. Analysis of Variance (ANOVA) was performed on this data to confirm that it was statistically accurate.

The responses were divided into three groups, referred to as Change Experts, Change Intermediates, and Change Beginners, based on the level of successful change adoption to test significant differences between these groups using ANOVA. Here, Change Experts were defined as the top one-third of most successful change adoption cases collected within the data sample (as measured by the Change Adoption Construct., Change Intermediates were defined as the middle one-third change adoption cases. Change Beginners represented the one-third of cases which had the lowest change adoption success rate.

Descriptive Analysis

Descriptive statistics were used to compare employee reactions to change between organizations with successful and failed change adoption cases. Also, bar charts were developed to

compare the methods of communicating change throughout organizations between successful and failed change adoption cases. Frequencies and percentages of reactions were analyzed using Statistical Package for the Social Science (SPSS) software. Bar charts on the data were created using MS Excel to show the frequency of each reaction to change and ways of communicating the change.

Mediation Effect

Preachers and Hayes (2004) explained the Indirect Mediation effect and developed a macro to conduct the Indirect Effect using IBM SPSS. This method was adopted to understand the effect of an independent variable on a dependent variable via introducing another variable called as mediator variable and this technique is called as Indirect Mediation Technique. The effect of the independent variable on the dependent variable is called a Direct Effect or Mediation Effect (C^1). The product of "A" (Effect of the independent variable on mediator variable) and "B" (Effect of the mediator variable on the dependent variable) is called an Indirect Effect.

Total Effect (C) = Direct effect (C^1) + Indirect Effect (A*B)

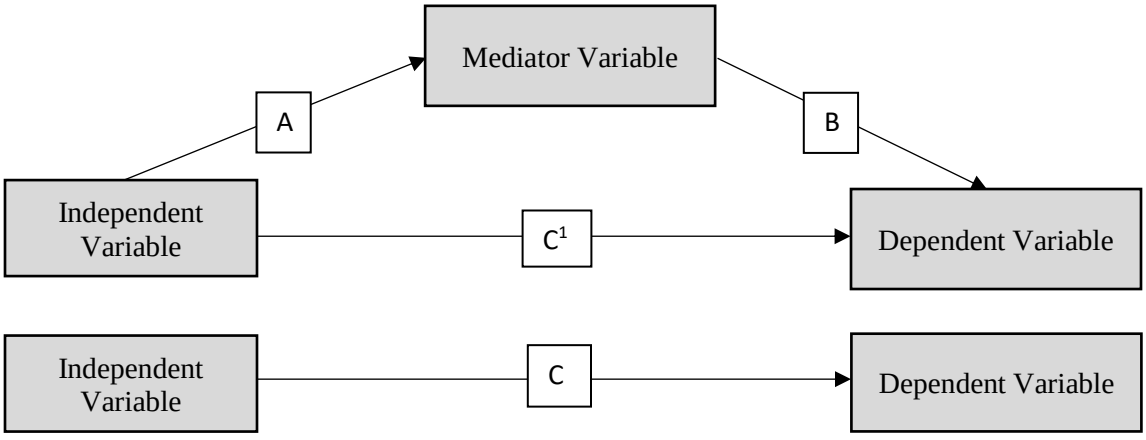

Figure 5. Illustration of Direct and Indirect Effect

In this statistical mediation model as shown in Fig. 5, "C^1" represents the effect of independent variables on dependent variables through the mediator variable. The effect of an independent variable on a dependent variable without consideration of any other terms is Simple (Total) Mediation Effect (C) and is often referred to as the Total effect of independent variables on the dependent variable. The total effect is the sum of direct effect and indirect effect (Elliot *et al.*, 2011).

Analysis of Variance (ANOVA)

ANOVA is a statistical test to show statistically significant differences between the means of three or more independent groups. The Tukey post-hoc test was also performed to determine all possible pairwise comparisons between variable groups.

4.6 Results

Spectrum of Employee Reactions to Organizational Change Initiatives within the AEC Industry

Respondents were asked to select the top three most prevalent reactions they observed from employees during an organizational change initiative their company implemented. Some respondents selected only one reaction and some selected two of the eight reactions. Responses to only three reactions were considered valid, and all the other reactions were ruled out from this analysis. All valid responses with the top three reactions selected by each volunteer were analyzed using SPSS. This table concludes that the majority of volunteers noticed Passively Supporting, Reluctantly Complying, and Actively Supporting as the most common reactions of employees which were accepted by 21%, 20 %, and 18% respectively. Only 6% of the responses selected Championing and 5% of the total responses observed Overtly Opposing reactions of employees to change. Respondent data of the three most prevalent employee reaction types was also compiled to determine the overall employee reactions within each organizational change initiative.

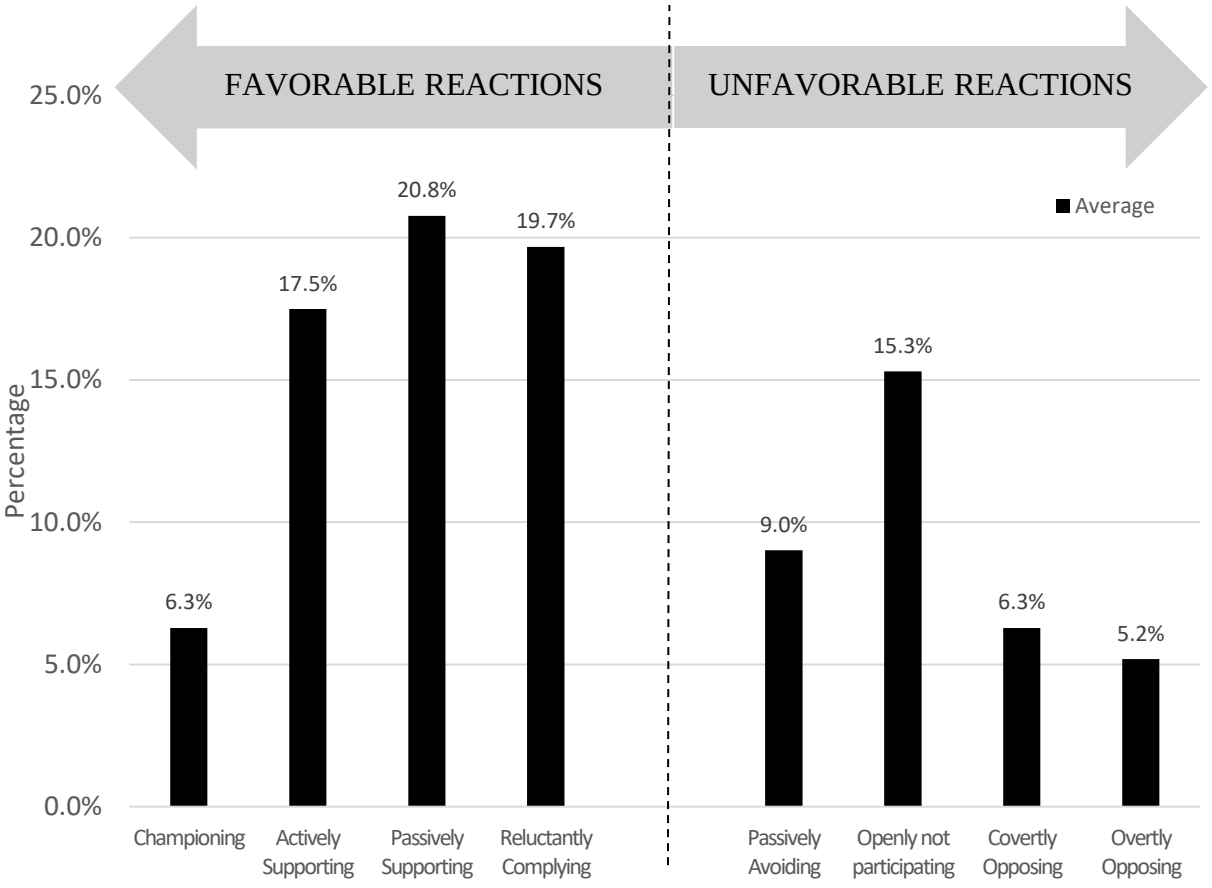

Figure 6. Average of Employees' Reaction Noticed Across AEC Industry

All the responses were arranged based on Change Adoption Construct calculated on IBM SPSS software by PCA. Responses were collected on reactions of employees and are shown in Fig.6. Of all responses, 6.3% of the total were Championing, 17.5% were Actively Supporting, 20.8% were Passively Supporting, 19.7% were Reluctantly Complying, 9% were Passively Avoiding, 15.3% were Openly Not Participating, 6.3% were Covertly Opposing, and 5.2% were Overtly Opposing. The highest number of responses selected Passively Supporting (20.8%), Reluctantly Complying (19.7%), and Actively Supporting (17.5%), as the top three reactions of employees on the positive side of change. Only 5.2% of responses selected that they noticed Overtly Opposing, 6.3% selected Covertly Opposing, and 9% selected Passively Avoiding on the negative side of reactions.

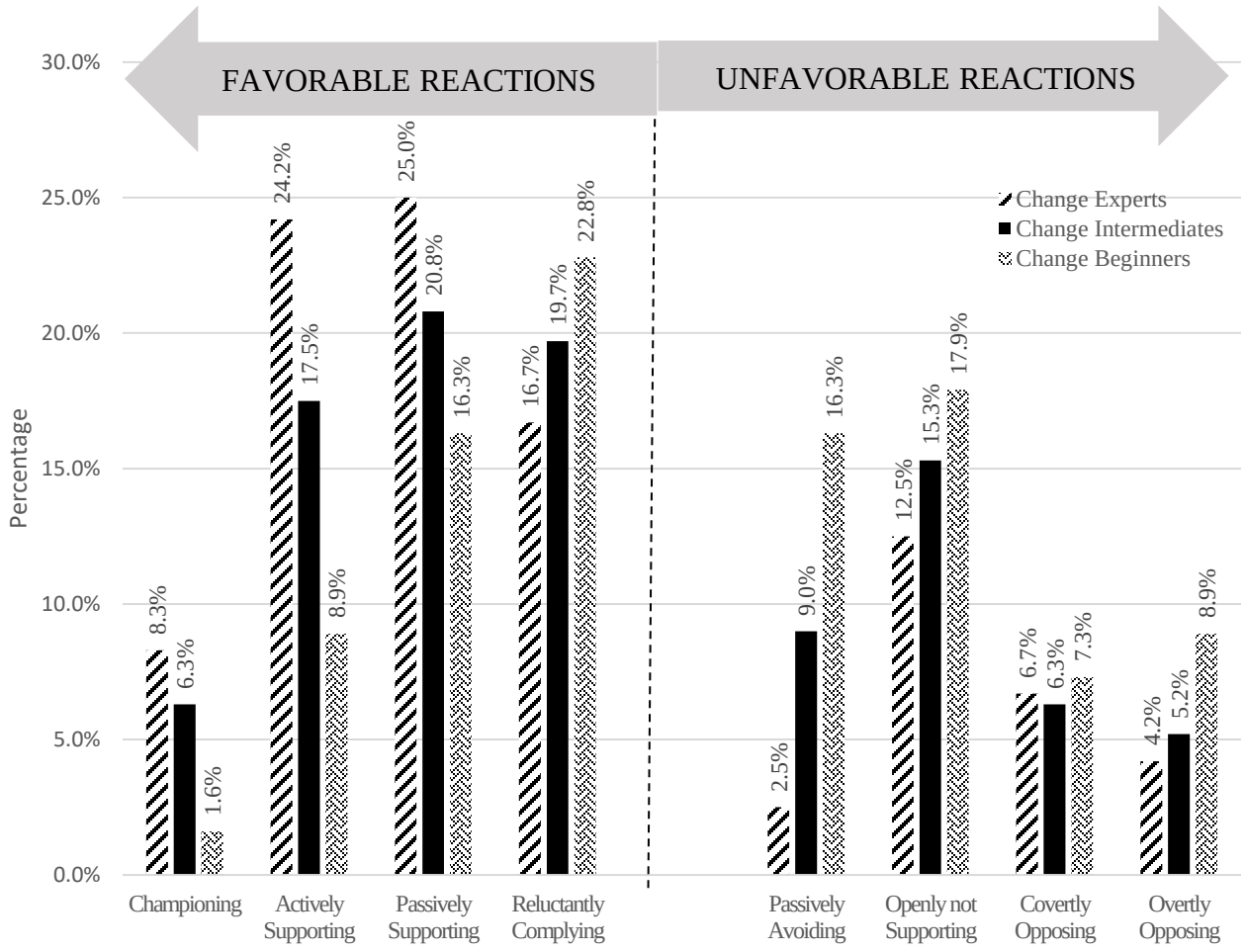

Figure 7. Bar Chart Representing Employees' Reactions Comparing between Change Experts, Average, and Change Beginners

All these responses were divided into three groups: Change Experts, Change Intermediates, and Change Beginners. Overall employee reactions were compared between the Change Experts and Change Beginners and is shown in Fig.7. Organizations with high change adoption rates observed more favorable reactions, such as Championing, Actively Supporting, and Passively Supporting, and organizations with low change adoption rates noticed unfavorable reactions, such as Passively Avoiding, Openly Not Participating, Covertly Opposing, and Overtly Opposing. Of these Change Experts, 8.3% selected Championing, 24.2% selected Actively Supporting, 25% chose Passively Supporting, and 16.7% selected Reluctantly Complying on the positive side of reactions, whereas of

Change Beginners, 1.6% selected Championing, 8.9% selected Actively Supporting, 16.3% selected Passively Supporting, and 22.8% selected Reluctantly Complying with change. Substantial differences were noticed between the Change Experts and Change Beginners' reactions on negative sides too. Of the Change Experts, 2.5% selected Passively Avoiding, 12.5% selected Openly Not Participating, 6.7% selected Covertly Opposing, and 4.2% selected Overtly Opposing. On the other side, 16.3% voted that they noticed Passively Avoiding, 17.9% selected Openly Not Participating, 7.3% selected Covertly Opposing, and 8.9% voted Overtly Opposing.

Mediation Effect of Overall Employee Reactions to Change

Indirect Mediation analysis was conducted on the data using SPSS to know the Mediation Effect of the independent variable "Drivers of Change" (constructed of six independent variables defined in Chapter 3, which were Personal Benefits, Senior Leadership Commitment, Implementation Time-Scale, Action Steps, Change Agent Effectiveness, and Established Benchmarks) on "Change Adoption Construct" as the dependent variable through "Overall Employee Reactions to Change" as the mediator variable as shown in Fig.8. The coefficient of the A- path was A=0.644 (effect of independent variable on mediator variable) which was statistically significant (p=0.00). The coefficient of B-path was B=0.410 (effect of mediator variable on the dependent variable) which was not statistically significant (p=0.147). The direct effect of the independent variable on the dependent variable after controlling for mediator variable was C^1=0.771 (Overall Employee Reactions to Change) which was statistically significant (p=0.000). The total effect of the independent variable "Drivers of Change" on the dependent variable "Change Adoption Construct" was statistically significant (p=0.000) and very strong (C=0.797).

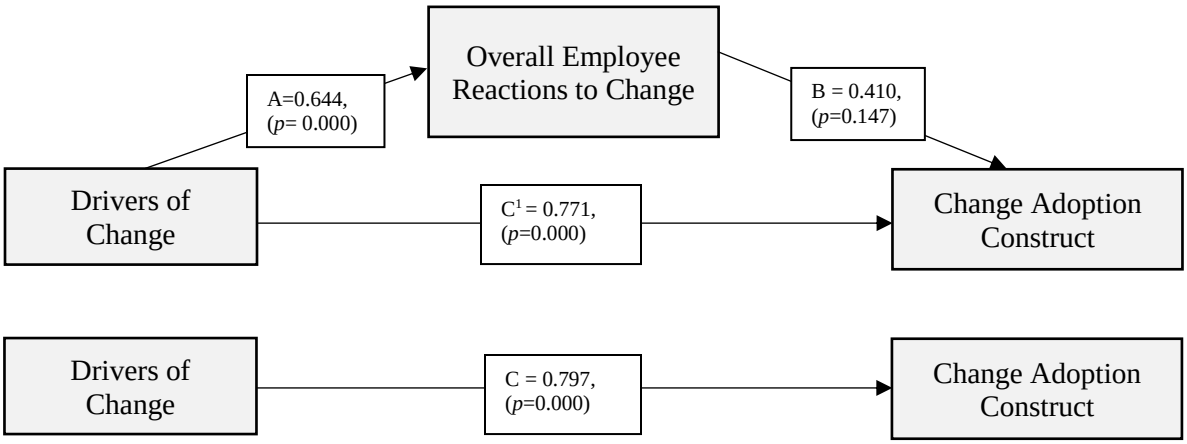

Figure 8. Figure Showing the Mediation Effect of Overall Employee Reactions to Change

ANOVA

For further investigation, a one-way ANOVA was conducted on the data to know that the average of employees' reactions is different for different groups. Participants were classified into three groups based on Change Adoption Construct. The Change Experts (n=88), Change Intermediates (n=68), and Change Beginners (n=73) based on Change Adoption Construct. ANOVA results and Tukey post-hoc analysis results are shown in Table 16.

Table 16. Summarized Results of ANOVA and Tukey Post-Hoc Analysis

(I)	Mean	SD	(J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Change Experts	2.80	1.39	Change Intermediates	-0.58*	.237	.038	-1.14	-0.02
Change Intermediates	3.39	1.40	Change Beginners	-0.87*	.248	.001	-1.46	-0.29
Change Beginners	4.27	1.61	Change Experts	1.46*	.232	.000	.091	2.01

*. The mean difference is significant at the 0.05 level.

There was the homogeneity of variances, as assessed by Levene's test for equality of variances (p=0.603). Average Reactions of employees increased from the Change Experts (M=2.8, SD=1.4) to the Change Intermediates (M=3.39, SD=1.4) to the Change Beginners (M=4.26, SD=1.61) in order, but the difference between these three groups was statistically significant F(2,226) =19.81, (p=.000). Tukey post-hoc analysis also revealed that the average of employees'

reactions increased from the Change Experts (M= 2.8, SD=1.4) to the Change Beginners (M=4.26, SD=1.61) and the differences between these groups was also statistically significant (p=0.001).

Various Methods of Change Message Communication

Respondents were also asked to select the top three ways that organization members used to communicate the change throughout the organization. The bar chart was plotted based on the communication types used in the organization as shown in Fig.9. Responses showed that "Presentations" were the highest active (22.8%) communication type by the organizations. "Memos" were the second highest (18.4%) of the respondents.

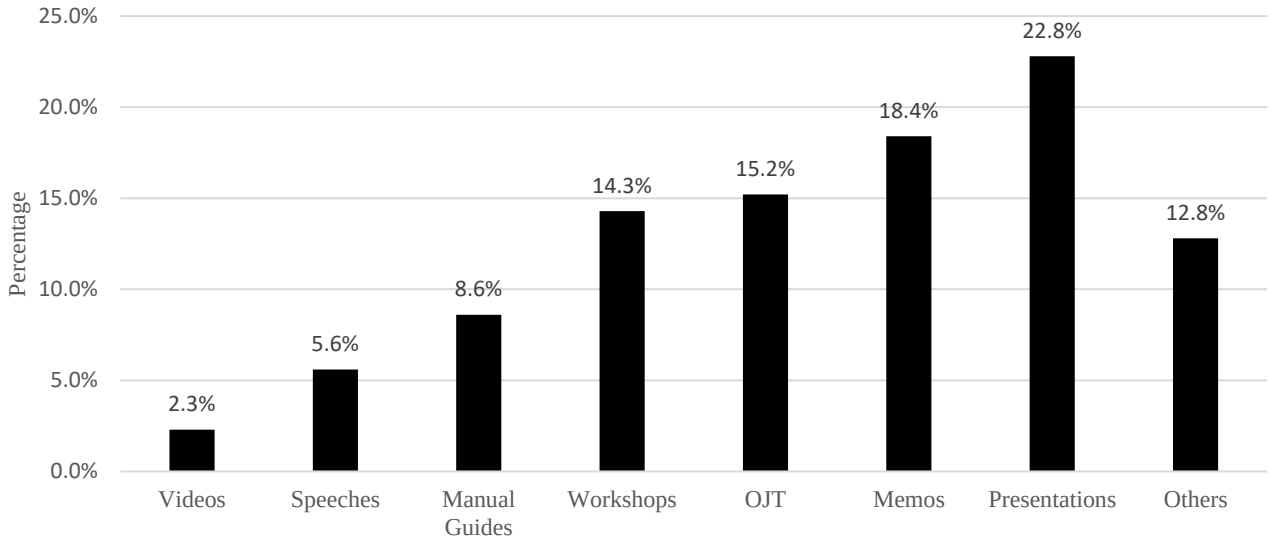

Figure 9. Average of Change Communicating Types Used Across AEC Industry

The third largest method of communicating change used was "On the Job Training" (15.2%), followed by "Workshops" (14.3%) and "Manual Guides" (8.6%). "Speeches" and "Videos" were the least used ways to communicate change with 5.6% and 2.3% respectively. "Other type of communication" was selected 12.8% of the time, which was not mentioned in the survey.

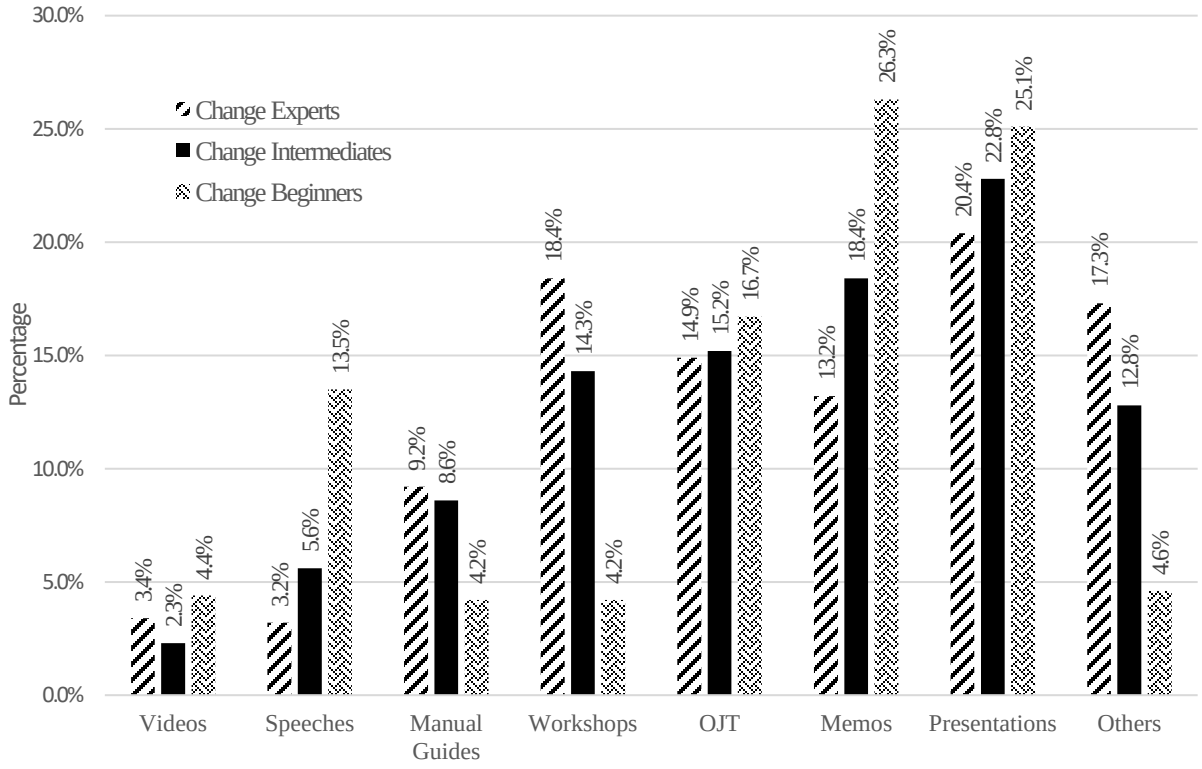

Figure 10. Bar Chart Representing Communication Types Comparing between Change Experts, Average, and Change Beginners

Responses were divided into three groups: Change Experts, Change Intermediates, and Change Beginners. Reactions of employees were compared between the Change Experts and Change Beginners, and is shown in Fig.10. The Change Experts selected "Presentations" (20.4%) as the most widely used type of communication across the organization and "Workshops" (18.4%) as the second highest. "On the Job Training" (14.9%) and "Memos" (13.2%) were selected as the third and fourth best-used types of communication to broadcast change throughout organizations respectively. "Manual Guides," "Speeches," and "Videos" stood at the last three positions with 9.2%, 3.2%, and 3.4% respectively. From the above chart, Workshops and Manual Guides are the only two kinds of communication which Change Experts followed but not Change Beginners. Therefore, organizations must conduct more workshops and provide manual guides to drive change through all employees. Speeches, Memos, and Presentations were also adopted by both Change Experts and Change

Beginners, but it appears they did not work efficiently in communicating the skillset required to adopt the change.

Case Studies

Interviews were conducted with industry professionals as explained in the methodology section. These interviews mainly focused on the barriers faced during the time of implementing the change and how the organizations overcome with these barriers and also how organizations overcome the resistance behavior of the employees.

Case Study 1

The interviewee of this implementation process was an experienced regional supervisor working on implementing "Best Value Procurement" in a public university. He mentioned that lack of belief in change and lack of resources were the biggest barriers faced during the process of implementing the best value business model. Employees were apprehensive to change initially, which led to sabotaging the approach and eventually to failing in implementation. To overcome these adverse reactions, the organization needed to find leaders who could manage change and bring a positive environment in an organization, which helps to develop the state of equilibrium.

Change agents were crucial in implementing the change and had a substantial impact on people overcoming resistance by explaining the benefits and the need for change. The interviewee also mentioned that it was noticed that many change agents failed in implementing change. When he was asked about the importance of senior leadership commitment, the response was that the senior leadership commitment could be compared to a double-edged sword. The organization cannot implement change without senior leadership commitment, and senior leaders cannot implement change by themselves. Senior leaders should be on board to support the employees to adopt change all the way.

Case Study 2

The respondent of this case study was a senior executive at the County of San Diego who worked in "realignment of purchasing and contracting organization" and mentioned their biggest barriers during realignment were the staff with longtime experience who had little or no change in the past and were cautious in their approach towards the new way of doing business. Leaders' clear explanation of why the change is necessary and their commitment in seeing realignment throughout the process were the biggest drivers that led to successful realignment. Negative reactions were noticed at early stages of implementing the change as employees were used to the old way and were scared to change. Employees with these reactions were taught about the benefits of realignment that made them overcome the negative feeling about it and made them committed towards the change which eventually resulted in a faster realignment of the business model.

Change agents' role was critical in this process implementation. They had a clear understanding of the reason for the change, and they related the change to their employees and explained them to the employees in their own tempo. Senior Leadership's commitment was also another critical thing which was required to push employees towards change adoption by drawing a picture on how important is the change for each of them in an organization. This also helps to make sure that employees following the change, focused on the adopted change and declaring the accomplishments made by adopting the change. Annual Customer satisfaction survey was conducted to track the benchmarks throughout change process and added two other metrics scaled 1 through 5 to compare pre-change adoption and after implementation.

Case Study 3

Respondent of this case study was a project team member worked on implementing BIM. The biggest barriers mentioned were a lack of key metrics to measure success, and the organization

had only one change agent for the department of 500+ employees. Employees were resisted to change in the organization because of having no knowledge of why is it important to implement the change. This resulted in slowing down the process of implementing BIM. The understanding of the change benefits turned most of the employees towards the positive side of BIM, and thus employees adopted it as the organization wanted to be a cutting edge of the industry.

Senior Leaders and Change Agents played a crucial role in implementing the change as change agent tried to socialize with employees by taking them to lunch and understand their difficulties with the new methods. Change Agent collected feedback at regular intervals and updated the status of employees to leaders. Cost and time were the two basic measurements used to track down the results of change before adoption, during adoption, and after implementation. Customer satisfaction and Global rank of the organization were two additional measurements considered for better comparison of achievements made by implementing BIM in the organization.

Case Study 4

Respondent of this case study was a senior executive of an organization worked on "implementing standardized risk management." The interviewee noted that many of the organization's employees were uncomfortable with the change, which lead to fearful and resistive reactions. People were hand-picked by the senior executive to lead the transition based upon their belief in what organization was doing and why it was necessary to improve the organization's performance.

The respondent, in this case, was a senior level change agent and trusted superiors of this small organization and it was easy to adopt change than in large organization which would be bureaucratic. Senior leadership commitment was crucial to take over the responsibility and make sure that change is sustained or else all the process of implementation would go in vain. Staff

meetings, feedbacks were collected at regular intervals while implementing change. Improvements in the organization were documented on regular intervals of implementing the process.

Case Study 5

This was the case study of "restructuring the management and creating a new vertical" and respondent of this study was senior director of the private organization. It was mentioned that there was a lack of clarity to the employees on the restructuring process. Employees reacted negatively because either they felt that they were not a part of the process or they were not aware of the importance of change which eventually affected implementation time-scale. The organization socialized the change ahead of the implementation process and made employees understand the benefits of change.

The organization used change initiatives which were dedicated to change implementation as of their created roadmaps for the process of implementation. Activities like marketing, training, communications, etc. were the planned strategies in adoption. Senior level participation was critical in driving change by communicating to their people in their own words and to make employees comfortable with change. A baseline was created on performance indicator and tracked all the points with old and new adopted change to measure the benefits of adopted change in the organization.

4.7 Discussion

Employee Reactions to Organizational Change

From all the responses obtained, it is noticeable that employees were favorable and slightly inclined towards organizational change. Around 65% of employee's reactions to the change were positive, and around 35% of the total cases were of negative reactions which concludes that the employees of organizations were acting positively to adopt change. Only a few people initiate the change in an organization but, most of the people either accept the change or reluctantly comply

with the change. Of 35% employees who showed negative reactions to change, 15% were Openly Not Participating, and only 5.2% were extremely opposing the change. There is nothing that an organization can do about this five percent of employees who extremely oppose the organizational change. Senior Leaders and change agents should be a concerned for individuals who are Passively Avoiding and Openly Not Participating in the process of implementing the change. A small shift in this category could make a large difference in adopting the change.

These responses of reactions were compared between Change Experts and Change Beginners concludes that Change Experts were able to create more favorable employee reactions than Change Beginners. Major differences were noticed between employee reactions of Change Experts and Change Beginners. Additional 15% of employees were noticed to be embracing and initiating the change in Change Experts than Change Beginners. There was a difference of 13% noticed on people quietly avoiding the change. This 13% of people might have led the organization towards the failure of change adoption. These results indicate that the response to innovations within AEC industry was fairly consistent with Rogers' (2003) popular theory called "Diffusion of Innovations."

It was also statistically verified that the change management practices affect how employees react to change, which was not surprising. Results indicate that it is possible to obtain the successful change adoption even without the positive reactions of employees. Surprisingly, there was no Mediation Effect of employees' reactions noticed on change adoption. Employees do adopt change though they resist it might be because of their position in the organization or senior managers in the company may force them to adopt the change or requires certain circumstances i.e. emergency situations or crisis.

Successful change adoption requires more than simply creating favorable reactions among an organization's employees. Employee reactions to change were not found to mediate between the

predictor of change management practices and the dependent variable of change adoption. This result indicates that although it is certainly important to build employee support, other aspects of change management are also needed to bring about successful change adoption. One crucial function of change management strategies is to provide an appropriate structure including change-related planning, training, and procedures to support the organization and its employees implement the change at the operational level.

Various Methods of Change Message Communication

From the results, it can be concluded that presentations are the most accepted way to communicate the change, followed by Memos, and On the Job Training throughout the industry. This might be because of presentations on these changes are the easiest way to communicate through the organization. Memos and On the Job Training are also adopted by many organizations so that they can communicate the change to employees in real time job and memos are another way to reach all employees in an organization. Speeches and videos were the least two ways organizations used to communicate change. This might be the case because speeches are ineffective at instructing employees in the new skillsets needed to adopt the change.

The organizations with highest change adoption rate used workshops, Manual Guides and other methods which were not mentioned in the survey. From this, it can be concluded that workshops work better for employees where they can learn some practical benefits of the change. Presentations are the largest preferred method both in organizations with high and low adoption rate. But it seems like presentation did not work because Change Beginners used it more than Change Experts and failed. Distributing Memos to employees was also preferred by Change Beginners than Change Experts which explain that Memos doesn't communicate change efficiently throughout the organization. Organizations also used Speeches observed low success rate. Hence, Workshops,

Manual Guides are the top two ways to communicate the change to the employees of an organization than handing out memos, presentations, and Speeches.

4.8 Conclusion

The objective of this study was to answer the question: Do reactions affect Change Implementation in AEC industry? A global survey was conducted with 165 responses on how employees reacted to the implementation of change in an organization. Interviews were conducted to know more about the effects of positive and negative reactions on five individual change implementation cases.

Contributions

The data used for this analysis was a global survey response of the AEC Industry with 165 organizational change initiatives from all over the world where each response in this analysis is a different organizational change implementation case. Whereas in the other AEC literature, many of those published journals have the data sets which are limited to a small number of change initiatives or cases.

The Change Experts were more effective at creating favorable reactions and positive support within their companies. The most successful change initiatives experienced approximately 10 percent more employee reactions categorized as being strongly supportive when compared to the industry average (and 20 percent more than the least successful change initiatives measured in the study). A key contribution of this study is the statistically significant difference between employee reactions within the most and least successful change initiatives, which may indicate that seemingly small increases in support may, in fact, have a large impact on successful change adoption. Practitioners are therefore encouraged to consider the “hearts and minds” aspects of a change effort in addition to the “nuts and bolts” specifics.

The study results contribute practical implications for AEC firms. First, this study demonstrates that successful change implementation in an organization is possible even without overwhelming positive reactions. The fact that Employee Reactions is not a moderator indicates that wanting the change to success is different than implementing the structured actions necessary to execute change adoption. This paper also suggests that organizations should conduct Workshops and provide Manual Guides to communicate the change ahead of time before change implementation process starts to foresee the successful change adoption.

Limitations of this Research

Several study limitations were identified along with suggested areas of future studies. First, the global nature of the study did not account for regional, national, or other geographically-based differences in organizational change dynamics. Further, the questionnaire was only administered in English, and as such, native English speakers may have had an advantage over non-native English speakers when responding to the study.

The results likely suffer from a positive bias. Survey respondents were allowed to select which organizational change event they reported; therefore, it is possible that respondents were motivated to share more favorable examples of change adoption. Future research designs are recommended to collect an equal sample of successful and unsuccessful change initiatives to balance the dataset.

Respondents were asked to pick top three ways they used to communicate change rather than asking to rank top three which would be more precise in predicting the best way to communicate the change. The case studies were hand-picked based on their rate of change adoption. These were limited to five, due to the availability of volunteers.

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CHAPTER 5 - SUMMARY AND CONCLUSIONS

The objective of this study was to collect a global sample of organizational change initiatives across the AEC industry to identify whether specific change management practices have a direct relationship with successful change adoption. This study also sought to identify the spectrum of employee reactions to organizational change within the AEC industry and investigate how employee reactions moderate change management practices and change adoption. A total of 237 organizational change events were collected in the study data sample. In summary, the findings from this research indicate the following results:

1. There was a statistically significant positive correlation between critical change management strategies from the organizational behavior literature and change adoption within AEC firms. This result confirms that these change management strategies do influence the success rate organizational change adoption within the AEC industry. The six leading change management drivers together explained 58% of the variance in the Change Adoption Construct.
2. The results of this study are overall fairly consistent with Rogers' (2003) diffusion of innovation categories, which serves to dispel notions that the AEC industry is resistive to change when compared with other industry sectors. The results were deemed to be representative of a fairly broad sample size because the research design of this study collected metrics of employee reactions from 165 separate organizational change events. Measuring how the AEC industry responds to an organizational change in this manner is an important

contribution to the literature as previous studies have not addressed this topic on an industry-wide scale.

3. Employee reactions to change were not found to mediate between the predictor of change management practices and the dependent variable of change adoption. This result indicates that although it is certainly important to build employee support, other aspects of change management are also needed to bring about successful change adoption. The fact that Employee Reactions is not a moderator indicates that wanting the change to success is different than implementing the structured actions necessary to execute change adoption.
4. Certain forms of communication were found to be more effective in disseminating the organizational change vision to employees throughout the company. Organizations are recommended to emphasize workshops, practical guides and manuals, and on-the-job training approaches. These communication methods were found to be more effective than speeches, memos, and presentations in facilitating a successful change adoption process.

Research Contributions

The global data sample is a meaningful contribution to the AEC literature, which primarily consists of case-based studies that are limited to a single type of organizational change event. Further, this study contributes a practical guidance to the industry professionals by linking critical change management strategies with organizational change adoption to have a successful adoption of new technologies, management strategies, and business practices efficiently within their organizations. This study also quantified how the AEC industry responds to organizational change, which is an important contribution to the literature as previous studies have not addressed this topic on an industry-wide scale. These results also enable comparisons between the AEC industry and other sectors from an organizational change perspective.

Limitations and Suggestions for Future Research

Several study limitations were identified along with suggested areas of future studies. First, this study considered only six change management practices in predicting the output variable, Change Adoption Construct. Together, these independent variables explained 58% of the variance. This left 42% unexplained, which may have a substantial contribution in predicting the rate of change adoption. Future researchers may consider obtaining more open responses to know the change management strategies better.

Second, the questionnaire was created in English, which gives an advantage to native English speakers over non-native English speakers. Future researchers may convert the questionnaire into other local languages when collecting responses globally.

Third, the results likely suffer from a positive bias. Survey respondents were allowed to select which organizational change event they reported; therefore, it is possible that respondents were motivated to share more favorable examples of change adoption. Future research designs are recommended to collect an equal sample of successful and unsuccessful change initiatives to balance the dataset.

Fourth, the interview case studies were hand-picked based on their rate of change adoption. These were limited to five due to the availability of volunteers. Future researchers may select more cases from both extremes of successful and failure stories of organizational change adoption which makes a better comparison of successful strategies.

Fifth, respondents were asked to pick the top three ways they used to communicate change rather than ranking the top three, which would be more precise to analyze the best way to

communicate change for better results. Studies in the future may design the survey in such a way to find the rankings of communication types used in an organization.

Another limitation was that the sampling technique allowed respondents to choose whether they reported a successful or unsuccessful organizational change initiative. Future studies may look more in detail at failure stories of the organizations as well as success stories. Thus, it would be effective in understanding the extremes the organization faces during the process of implementation.

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APPENDIX A – ORDINAL LOGISTIC REGRESSION RESULTS

Table 17. Ordinal Logistic Regression Parameter Estimates - Sustained Long-Term vs Independent variables

Parameter		n	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
					Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
Threshold	[Sus_=0]		.063	.5632	-1.040	1.167	0.013	1	.910	1.065	.353	3.213
	[Sus_=1]		.680	.5708	-0.439	1.799	1.418	1	.234	1.974	.645	6.041
[PB=Agree vs Disagree]		185 vs 38	1.103	.6600	-0.191	2.396	2.791	1	.095	3.012	.826	10.980
[PB=Neutral vs Disagree]		13 vs 38	.233	1.0733	-1.870	2.337	.047	1	.828	1.263	.154	10.350
[PB=Agree vs Neutral]		185 vs 13	.869	.9564	-1.005	2.744	.826	1	.363	2.385	.366	15.542
[SR_LEAD=Agree vs Disagree]		189 vs 27	.827	.6622	-0.470	2.125	1.561	1	.211	2.287	.625	8.376
[SR_LEAD=Neutral vs Disagree]		18 vs 27	.037	.8938	-1.715	1.788	.002	1	.967	1.037	.180	5.980
[SR_LEAD=Agree vs Neutral]		189 vs 18	.791	.7562	-0.691	2.273	1.094	1	.296	2.205	.501	9.708
[TIM_SC=Agree vs Disagree]		164 vs 47	-.321	.6541	-1.603	0.961	.240	1	.624	0.726	.201	2.615
[TIM_SC=Neutral vs Disagree]		22 vs 47	-.165	.8888	-1.907	1.577	.034	1	.853	0.848	.149	4.841
[TIM_SC=Agree vs Neutral]		164 vs 22	-.156	.8961	-1.912	1.601	.030	1	.862	0.856	.148	4.956
[Ac_ST=Agree vs Disagree]		174 vs 51	.606	.6138	-0.597	1.810	.976	1	.323	1.834	.551	6.107
[Ac_ST=Neutral vs Disagree]		12 vs 51	1.223	1.2708	-1.268	3.714	.926	1	.336	3.398	.282	41.006
[Ac_ST=Agree vs Neutral]		174 vs 12	-.617	1.2507	-3.068	1.835	.243	1	.622	0.540	.047	6.263
[Chang_Man=Agree vs Disagree]		151 vs 46	.227	.6819	-1.109	1.564	.111	1	.739	1.255	.330	4.776
[Chang_Man=Neutral vs Disagree]		28 vs 46	-.351	.7593	-1.839	1.137	.213	1	.644	0.704	.159	3.119
[Chang_Man=Agree vs Neutral]		151 vs 28	.578	.7622	-0.916	2.072	.575	1	.448	1.782	.400	7.939
[Meas_=Agree vs Disagree]		132 vs 80	1.368	.5718	0.247	2.489	5.724	1	.017	3.928	1.281	12.048
[Meas_=Neutral vs Disagree]		24 vs 80	2.493	1.1090	0.320	4.667	5.055	1	.025	12.103	1.377	106.398
[Meas_=Agree vs Neutral]		132 vs 24	-1.125	1.1720	-3.422	1.172	.922	1	.337	0.325	.033	3.227

Table 18. Ordinal Logistic Regression Parameter Estimates – Achieved Desired Goals vs Independent variables

Parameter		B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
				Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
Threshold [Desired_Goal=0]		3.013	.7717	1.500	4.525	15.242	1	.000	20.341	4.483	92.300
[Desired_Goal=1]		4.047	.8111	2.457	5.636	24.888	1	.000	57.206	11.668	280.470
[PB=Agree vs Disagree]	185 vs 38	.616	.6290	-0.617	1.849	.959	1	.327	1.852	.540	6.352
[PB=Neutral vs Disagree]	13 vs 38	-1.433	.8511	-3.101	0.235	2.833	1	.092	0.239	.045	1.265
[PB=Agree vs Neutral]	185 vs 13	2.049	.6998	0.677	3.420	8.570	1	.003	7.757	1.968	30.577
[SR_LEAD=Agree vs Disagree]	189 vs 27	2.405	.7258	0.983	3.828	10.983	1	.001	11.082	2.672	45.962
[SR_LEAD=Neutral vs Disagree]	18 vs 27	1.087	.8936	-0.665	2.838	1.479	1	.224	2.964	.514	17.082
[SR_LEAD=Agree vs Neutral]	189 vs 18	1.319	.6373	0.070	2.568	4.281	1	.039	3.738	1.072	13.038
[TIM_SC=Agree vs Disagree]	164 vs 47	.935	.5301	-0.104	1.974	3.112	1	.078	2.548	.901	7.201
[TIM_SC=Neutral vs Disagree]	22 vs 47	-.560	.7385	-2.008	0.887	.576	1	.448	0.571	.134	2.428
[TIM_SC=Agree vs Neutral]	164 vs 22	1.496	.6758	0.171	2.820	4.898	1	.027	4.462	1.187	16.781
[Ac_ST=Agree vs Disagree]	174 vs 51	.942	.5368	-0.110	1.994	3.081	1	.079	2.566	.896	7.348
[Ac_ST=Neutral vs Disagree]	12 vs 51	1.940	1.0467	-0.111	3.992	3.436	1	.064	6.961	.895	54.151
[Ac_ST=Agree vs Neutral]	174 vs 12	-.998	.9999	-2.958	0.962	.996	1	.318	0.369	.052	2.616
[Chang_Man=Agree vs Disagree]	151 vs 46	1.610	.5568	0.519	2.701	8.360	1	.004	5.002	1.680	14.897
[Chang_Man=Neutral vs Disagree]	28 vs 46	.135	.6229	-1.086	1.356	.047	1	.828	1.145	.338	3.881
[Chang_Man=Agree vs Neutral]	151 vs 28	1.475	.6460	0.208	2.741	5.210	1	.022	4.369	1.232	15.499
[Meas_=Agree vs Disagree]	132 vs 80	.730	.5015	-0.253	1.713	2.120	1	.145	2.075	.777	5.547
[Meas_=Neutral vs Disagree]	24 vs 80	1.269	.7194	-0.141	2.679	3.111	1	.078	3.557	.868	14.569
[Meas_=Agree vs Neutral]	132 vs 24	-.539	.7046	-1.920	0.842	.584	1	.445	0.584	.147	2.322
(Scale)		1									

Table 19. Ordinal Logistic Regression Parameter Estimates – Produced Beneficial Impacts vs Independent variables

Parameter		B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
				Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
Threshold [Imp_act=0]		2.169	.6381	0.919	3.420	11.560	1	.001	8.753	2.506	30.568
[Imp_act=1]		3.620	0.6989	2.250	4.990	26.831	1	.000	37.342	9.491	146.922
[PB=Agree vs Disagree]	185 vs 38	1.063	.5904	-.094	2.220	3.242	1	.072	2.895	.910	9.211
[PB=Neutral vs Disagree]	13 vs 38	-.401	0.7748	-1.920	1.118	.268	1	.605	.670	.147	3.058
[PB=Agree vs Neutral]	185 vs 13	1.464	0.6575	.175	2.753	4.958	1	.026	4.323	1.192	15.684
[SR_LEAD=Agree vs Disagree]	189 vs 27	1.771	.6702	0.457	3.084	6.981	1	.008	5.876	1.580	21.855
[SR_LEAD=Neutral vs Disagree]	18 vs 27	1.011	.8430	-0.641	2.664	1.439	1	.230	2.749	.527	14.348
[SR_LEAD=Agree vs Neutral]	189 vs 18	.760	.6240	-0.463	1.983	1.482	1	.224	2.137	.629	7.261
[TIM_SC=Agree vs Disagree]	164 vs 47	-.313	.5620	-1.415	0.788	.310	1	.577	.731	.243	2.200
[TIM_SC=Neutral vs Disagree]	22 vs 47	-.712	.7461	-2.175	0.750	.912	1	.340	0.490	.114	2.117
[TIM_SC=Agree vs Neutral]	164 vs 22	.399	.6853	-0.944	1.742	.339	1	.560	1.491	.389	5.712
[Ac_ST=Agree vs Disagree]	174 vs 51	1.305	.5235	0.279	2.331	6.214	1	.013	3.688	1.322	10.289
[Ac_ST=Neutral vs Disagree]	12 vs 51	0.044	0.7682	-1.462	1.550	0.003	1	.954	1.045	.232	4.710
[Ac_ST=Agree vs Neutral]	174 vs 12	1.261	.6987	-0.109	2.631	3.257	1	.071	3.529	.897	13.881
[Chang_Man=Agree vs Disagree]	151 vs 46	1.391	.5401	.333	2.450	6.635	1	.010	4.019	1.395	11.583
[Chang_Man=Neutral vs Disagree]	28 vs 46	0.453	.5838	-.691	1.598	0.603	1	.437	1.574	.501	4.941
[Chang_Man=Agree vs Neutral]	151 vs 28	0.938	.6004	-.239	2.114	2.439	1	.118	2.554	.787	8.284
[Meas_=Agree vs Disagree]	132 vs 80	1.497	.4688	.578	2.416	10.196	1	.001	4.468	1.783	11.198
[Meas_=Neutral vs Disagree]	24 vs 80	1.138	.6106	-.058	2.335	3.477	1	.062	3.122	.943	10.331
[Meas_=Agree vs Neutral]	132 vs 24	.358	.6251	-.867	1.584	.329	1	.566	1.431	.420	4.872
(Scale)		1									

Table 20. Ordinal Logistic Regression Parameter Estimates – Change Adoption Construct vs Independent variables

Parameter		B	Std. Error	95% Wald Confidence Interval Lower	95% Wald Confidence Interval Upper	Hypothesis Test Wald Chi-Square	df	Sig.	Exp(B)	95% Wald Confidence Interval for Exp(B) Lower	95% Wald Confidence Interval for Exp(B) Upper
Threshold	[Ch_Ad_Con=.00]	3.324	.8864	1.586	5.061	14.060	1	.000	27.767	4.887	157.781
	[Ch_Ad_Con=1.00]	5.743	.9718	3.839	7.648	34.933	1	.000	312.129	46.471	2096.481
[PB=Agree vs Disagree]	185 vs 38	.864	.6932	-0.494	2.223	1.554	1	.213	2.373	.610	9.234
[PB=Neutral vs Disagree]	13 vs 38	-2.155	1.0889	-4.289	-0.021	3.917	1	.048	0.116	0.014	0.979
[PB=Agree vs Neutral]	185 vs 13	3.019	.9116	1.233	4.806	10.970	1	.001	20.476	3.430	122.234
[SR_LEAD=Agree vs Disagree]	189 vs 27	1.329	.8030	-0.245	2.903	2.740	1	.098	3.778	.783	18.232
[SR_LEAD=Neutral vs Disagree]	18 vs 27	.177	1.0819	-1.943	2.298	.027	1	.870	1.194	.143	9.954
[SR_LEAD=Agree vs Neutral]	189 vs 18	1.152	.7685	-0.354	2.658	2.246	1	.134	3.164	.702	14.271
[TIM_SC=Agree vs Disagree]	164 vs 47	-.075	.5523	-1.157	1.008	.018	1	.892	0.928	.314	2.739
[TIM_SC=Neutral vs Disagree]	22 vs 47	-1.622	.9089	-3.404	0.159	3.186	1	.074	0.197	.033	1.172
[TIM_SC=Agree vs Neutral]	164 vs 22	1.547	.7781	0.022	3.072	3.954	1	.047	4.699	1.022	21.595
[Ac_ST=Agree vs Disagree]	174 vs 51	.240	.5640	-0.866	1.345	.181	1	.671	1.271	.421	3.838
[Ac_ST=Neutral vs Disagree]	12 vs 51	.199	.9047	-1.574	1.972	.048	1	.826	1.220	.207	7.187
[Ac_ST=Agree vs Neutral]	174 vs 12	.041	.7757	-1.480	1.561	.003	1	.958	1.042	.228	4.764
[Chang_Man=Agree vs Disagree]	151 vs 46	2.039	.6005	0.862	3.216	11.532	1	.001	7.685	2.369	24.936
[Chang_Man=Neutral vs Disagree]	28 vs 46	.172	.7032	-1.206	1.551	.060	1	.806	1.188	.299	4.715
[Chang_Man=Agree vs Neutral]	151 vs 28	1.867	.5689	0.752	2.982	10.770	1	.001	6.468	2.121	19.724
[Meas_=Agree vs Disagree]	132 vs 80	1.951	.4482	1.073	2.830	18.947	1	.000	7.036	2.923	16.937
[Meas_=Neutral vs Disagree]	24 vs 80	1.263	.6095	0.069	2.458	4.297	1	.038	3.537	1.071	11.680
[Meas_=Agree vs Neutral]	132 vs 24	.688	.5449	-0.380	1.756	1.593	1	.207	1.989	.684	5.787
(Scale)		1									

APPENDIX B - SURVEY QUESTIONNAIRE

Fiatech at the University Texas, along with University of Kansas, are conducting an industry-wide study to understand how organizational change initiatives impact various companies.

This brief survey will take less than 5 minutes to complete (11 multiple choice questions, plus a few optional questions). If you are unsure of a particular question, please leave it blank. Your responses will be kept confidential.

Within this survey, an Organizational Change Initiative is defined as:

A planned group-wide or department-wide adoption of a new innovation, with the goal of adopting the innovation into the organization's long-term operations.

Examples of a new innovation include the adoption of a new...

- business process
- corporate focus
- technology
- software
- safety program
- supply chain operation
- project control tool, etc.

Please think about a specific Organizational Change Initiative that had a significant impact on you and your work group (this initiative should be complete or nearly complete).

Please answer the following 9 questions based on your specific Organizational Change Initiative.

NOTE: The change initiative that you select can be considered **successful** OR **unsuccessful** - both are equally valuable to the research!!!

1) This change initiative was sustained long-term (3+years) to become part of "the way things are done around here." (*Choose one of the following answers)*

- Strongly Agree
- Agree
- Somewhat Agree
- Neutral
- Somewhat Disagree
- Disagree
- Strongly Disagree

2) During implementation, you had a clear understanding of how the change initiative benefited you personally (within your specific job function). *(Choose one of the following answers).*

- Strongly Agree

- ○ Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ○ Disagree
- ○ Strongly Disagree

3) Your organization's senior leadership were committed to the change initiative ("walked the talk"). (*Choose one of the following answers)*

- ◉ Strongly Agree
- ○ Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ○ Disagree
- ○ Strongly Disagree

4) The timescale & speed at which your organization implemented the change was realistic & achievable. (*Choose one of the following answers)*

- ○ Strongly Agree

- ○ Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ○ Disagree
- ○ Strongly Disagree

5) The desired performance and operational goals of this change initiative were achieved. (*Choose one of the following answers)*

- ○ Strongly Agree
- ○ Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ◉ Disagree
- ○ Strongly Disagree

6) During implementation, you had a clear understanding of what action steps were necessary to implement the change (within your specific job function). *(Choose one of the following answers)*

- ○ Strongly Agree
- ○ Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ◉ Disagree
- ○ Strongly Disagree

7) The Change Agents responsible for managing the overall change initiative within your organization were effective. ***(Choose one of the following answers)***

- ○ Strongly Agree
- ○ Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ◉ Disagree
- ○ Strongly Disagree

8) Your organization established clear benchmarks to evaluate the success of this change initiative (in relation to previous performance). ***(Choose one of the following answers)***

- ○ Strongly Agree
- ○ Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ◉ Disagree
- ○ Strongly Disagree

9) The change initiative had an overall beneficial impact on the organization and helped us be more competitive. (*Choose one of the following answers)*

- ○ Strongly Agree
- ○ Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ◉ Disagree
- ○ Strongly Disagree

Please answer the following 2 questions based on your specific Organizational Change Initiative.

10) During the initiative, what were the 3 main ways your organization communicated change-related training to personnel? (*Please select at most 3 answers)*

- ☐ Speeches
- ☐ Informational Presentations
- ☐ Memos & Emails
- ☐ Instructional Videos
- ☐ Instructional manuals, checklists, and/or guidebooks
- ☐ Interactive Workshops & Simulations
- ☐ Meetings & Phone Calls
- ☐ On-the-Project or On-the-Job Support
- ☐ Other: _____

11) During the initiative, which reactions were most common among the organization's personnel? (*Please select at most 3 answers)*

- ☐ Initiating, Embracing, Championing the change
- ☐ Actively Supporting and Cooperating with the change
- ☐ Passively Agreeing with and Accepting the change

- ☐ Reluctantly Complying with the change
- ☐ Ignoring, Withdrawing, Avoiding the change (covertly not participating)
- ☐ Refraining, Waiting, Observing the change (openly not participating)
- ☐ Stalling, Dismantling, Undermining (covertly opposing the change)
- ☐ Obstructing, Opposing, arguing (openly opposing the change)
- ☐ Other: _____

The next 3 questions are <u>OPTIONAL</u>.

To skip these, just click "Submit" at the bottom of the page.

1) Please provide a 1-sentence description of the specific Organizational Change Initiative you participated in.

For example, did your company...

...implement BIM? Integrate a new business process? Introduce a new software? Start a new safety program? Reorganize operating procedures? etc.

Your answer

2) Please list the biggest BARRIERS to the change initiative?

Your answer

3) Please list the greatest DRIVERS of success during change implementation?

Your answer

THANK YOU! Your responses have been submitted. Would you be kind enough to complete the following OPTIONAL demographic questions? It will provide some important baseline information for our survey. Afterwards, click "Finish!" and the survey is complete.

1) What kind of organization do you work for?

- (•) Owner / Operator
- ( ) EPC / General Contractor
- ( ) Specialty Contractor
- ( ) Architecture
- ( ) Engineering
- ( ) Material / Equipment Supplier
- ( ) Other: _____

2) What is your organization's industry sector? (*Check any that apply)*

- [x] Industrial (oil & gas, petrochemical, power generation, mining & materials, process plants)
- [ ] Infrastructure (civil works, airports, utilities)
- [ ] General Buildings (commercial, retail, public, healthcare, manufacturing)
- [ ] Other: _____

3) How many years of professional experience do you have?

- Less than 5 years
- 5 - 9 years
- 11 - 19 years
- 20 - 29 years
- 30-39 years
- 40 - 49 years
- 50 or more years

4) Indicate the role that best describes your current position.

- Senior Executive (CEO, CFO, COO, CIO, etc.)
- Vice President or Assistant Vice President
- Director / Regional Manager / Local Office Supervisor
- Project Lead (project manager, lead engineer, lead architect, etc.)
- Project Team (assistant project manager, site superintendent, field engineer, assistant engineer, project arc
- Other:

5) Please input the name of your organization. If multiple people from your organization complete the survey, we can send you customized results.

Your answer

6) If you'd like a copy of the industry-wide survey results, please provide your contact information below.

First and Last Name

Email Address

Phone Number

7) Where did you hear about this survey? Please check all that apply.

Check any that apply

- ☐ Fiatech
- ☐ MCAA
- ☐ ENR
- ☐ RFID
- ☐ Other:

8) Would you be willing to share your organizational change story in a short follow-up conversation?

(i.e. 10-15-minute phone conversation)

9) This would be a great help to the research!

- ◉ Yes
- ○ No

This is OPTIONAL and completely voluntary.

APPENDIX C – INTERVIEW QUESTIONS

Objective

More detailed information on "how" organizations can influence/affect the manner in which a change initiative is received/perceived/viewed by the people within the organization? We are narrowing on a couple of key elements of successful adoption to get the perspectives of various interview participants.

1. What are the main reasons that caused a negative reaction in Employees?
    a. What were the effects of negatively reacted persons on organizational change?
2. What actions did the organization take to create positive reactions?
    a. What was the effect of positively reacted persons on the change initiative?
3. The Role of Change Agent in overcoming negative people throughout the process of Change Implementation?
4. How do you think Senior Leadership Commitment is Important in driving the change? (What is Senior Leadership's role in overcoming resistance / creating positive reactions?)
5. How did you measure progress and results? What were the benchmarks used by the organization to measure the success of the change?
6. Anything that you wish has gone better/ made it easier?
7. Any other thoughts, comments, feedback, observations?

APPENDIX D – ORGANIZATIONAL CHANGE ADOPTION CASES CAPTURED IN LITERATURE REVIEW

Author	Year of Publication	Data Collection Method	Type of Innovation
Florence Berteaux Amy Javernick-Will	2015	Surveys and Interviews	Environmental Project
Bon-Gang Hwang, Xianbo Zhao Shi Ying Ong	2015	Surveys	Value Management
Seulki Lee Jungho Yu David Jeong	2015	Surveys	BIM
Beliz Ozorhon Emrah Cinar	2015	Surveys	Enterprise Resource Planning
E. Sackey M. Tuuli A. Dainty	2015	Interviews and Case Studies	BIM
Beliz Ozorhon	2014	Case Studies	Environmental Format Store Eco-Residences Project Estate Regeneration Project
Beliz Ozorhon Carl Abbott Ghassan Aouad	2014	Case Studies	Modern Methods of Construction Lean Construction
M. Motiar Rahman	2014	Surveys	Modern Methods of Construction
Hai Chen Tan Patricia M. Carrillo Chimay J. Anumba	2013	Surveys	Knowledge Management
Tas Yong Koh Sui Pheng Low	2011	Surveys	Total Quality Management
Patricia Carrillo Herbert Robinson Peter Foale Chimay Anumba	2008	Surveys	Private Finance Initiative
Tarek Elghamrawy Tomoya Shibayama	2008	Surveys and Interviews	Total Quality Management
O. Salem J. Solomon A. Genaidy I. Minkarah	2006	Case Studies	Lean Construction

Irem Dikmen M. Talat Birgonul S. Umut Artuk	2005	Interviews	Value Innovation
Gustavo Castill Luis F. Alarco´n	2015	Interviews and Case Studies	Lean Production
Xianbo Zhao Bon-Gang Hwang	2015	Surveys	Enterprise Risk Management
Hemanta Doloi	2014	Surveys	Web-Based Project Management Systems
Ming-Guang Li Jin-Jian Chen	2014	Case Studies	Innovative Top-Down Construction
Paul Arnold Amy Javernick-Will	2013	Surveys and Case Studies	Construction Project Management Software Systems
Jongsung Won Ghang Lee, Ph.D	2013	Surveys and Case Studies	BIM
Jumie Yuventi Raymond Levit	2013	Case Studies	PV Systems
Xia Bo Albert P. C. Cha	2012	Surveys	Design Build System
Behzad Esmaeili Matthew R. Hallowell	2012	Interviews	Safety Program
Bon-Gang Hwang, Jia Wei Ho	2012	Surveys	Front End Planning
Nan Li Burcin Becerik-Gerber	2011	Case Studies	Radio Frequency Identification
Arjen Adriaanse Hans Voordijk	2010	Interviews	Information and Communication Technology
Jeffrey S. Bohn Jochen Teizer	2010	Surveys	Automated Camera
Daniel W. M. Chan et al	2010	Surveys	Guaranteed Maximum Price
Robert M. Leicht Samuel T Hunter Chiotwan Saluja	2010	Case Studies	Virtual Construction Simulator
Susan Shepherd Susan R Woskie	2010	Case Studies	Engineering Control for Concrete Grinding Dust: Local Exhaust ventilation
Davis, K. Songer, A	2009	Surveys	Information and Communication Technology
Albert P. C. Chan et Al	2009	Surveys	Public Private Partnerships
Moonseo Park Sae-Hyun Ji	2009	Surveys	Design Build

Carrie Sturts Dossick Makoto Sakagami	2008	Interviews	Web Based Project Management
Gul Polat	2008	Surveys	Pre-Cast Concrete Systems
Trefor Williams Leonhard Bernold	2007	Surveys	Information Technology
Lim Jay Na George Ofori Moonseo Park	2006	Analysis of Secondary Data	Innovation
Low Sui Pheng Mok Sze Hui	2005	Case Studies	Six Sigma
Zhikun Ding Jian Zuo Jinchuang Wu J.Y. Wang	2015	Surveys	BIM
Solomon Olusola Babatunde, Srinath Perera, Lei Zhou Chika Udeaja	2015	Surveys	Public Private Partnerships
John Rogers Heap-Yih Chong Christopher Preece	2015	Surveys and Interviews	BIM
Vishal Singh Jan Holmstrom	2015	Surveys and Interviews	BIM
Emma A.M. Bevan Ping Yung	2015	Surveys	Corporate Social Responsibility
Ali Rostami, James Sommerville, Ing Liang Wong Cynthia Lee	2015	Surveys	Risk Management
Nicholas Chileshe Geraldine John Kikwasi	2014	Surveys	Risk Management
Per Anker Jensen Elvar Ingi Jo´hannesson	2013	Surveys	BIM
Farzad Khosrowshahi Yusuf Arayici	2012	Surveys and Interviews	BIM
Mary Hardie Graeme Newell	2011	Surveys	Technical Innovation
Vanita Ahuja Jay Yang Ravi Shankar	2010	Surveys	Information and Communication Technology

Wei Pan	2010	Case Studies	Photovoltaic (PV) Air Source Heat Pumps (ASHP) Development Efficiency Plan (DEP) Glossary of terms
J.R. Henderson K. Ruikar	2010	Interviews	Technology Implementation
Per Erik Eriksson Brian Atkin TorBjo¨rn Nilsson	2009	Surveys and Interviews	Procurement procedures
Vachara Peansupap Derek H.T. Walker	2006	Case Studies	Information and Communication Technology
Vachara Peansupap Derek Walker	2005	Interviews	Information and Communication Technology
Rebecca Jing Yang	2015	Interviews	Building Integrated Photovoltaics
Hyojoo Son, Sungwook Lee, Changwan Kim	2015	Interviews	BIM
Kuo-Feng Chien Zong-Han Wu Shyh-Chang Huang	2014	Surveys	BIM
Robert Eadie Mike Browne Henry Odeyinka Clare McKeown Sean McNiff	2013	Surveys and Interviews	BIM
Richard Davies Chris Harty	2013	Case Studies	BIM
Youngcheol Kang William J. O'Brien James T. O'Connor	2012	Surveys	Information Integration
Yoora Park, Hyojoo on, Changwan Kim	2012	Surveys	Web based training
Y. Arayici P. Coates L. Koskela a, M. Kagioglou C. Usher K. O'Reilly	2011	Case Studies	BIM
Vanita Ahuja Jay Yang Ravi Shankar	2009	Surveys	Information and Communication Technology
M. Loosemore E. Cheung	2015	Interviews	Public Private Partnerships

Tahir M. Nisar	2013	Case Studies	Public Private Partnerships
Li-Ren Yang	2012	Surveys	Project Strategy to improve new product
Diana N.C. Lai Min Liu Florence Y.Y. Ling	2011	Surveys and Interviews	Safety Management
Jung-Ho Yu Hae-Rim Kwon	2011	Surveys	Critical Success Factors in Urban Regeneration Programs
Raymond Young Ernest Jordan	2008	Interviews and Case Studies	Change Adoption
M. Loosemore N. Andonakis	2007	Interviews	Occupational Health and Safety Regulation
John E. Taylor	2007	Interviews	Three-Dimensional Computer-Aided Design
Olugbenga T. Oladinrin Christabel M. F. Ho	2016	Surveys	European Foundation for Quality Management
James L. Burati Thomas H. Oswald	1993	Case Studies	Total Quality Management
YUN ZHOU LOIS M. MULLER	2003	Case Studies	Adapting E-Commerce